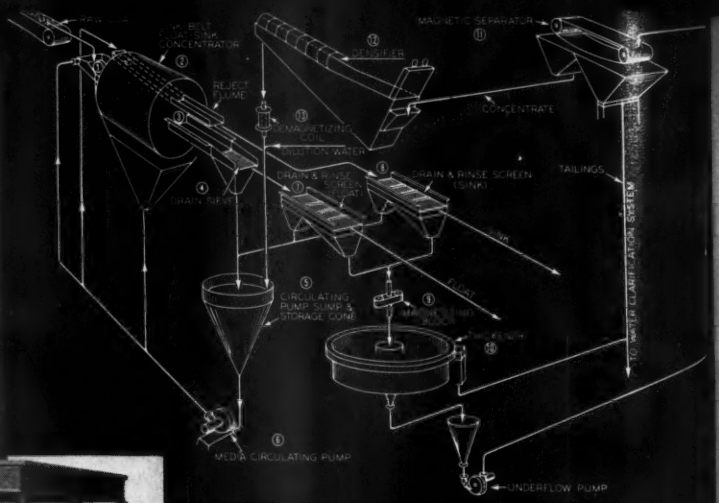
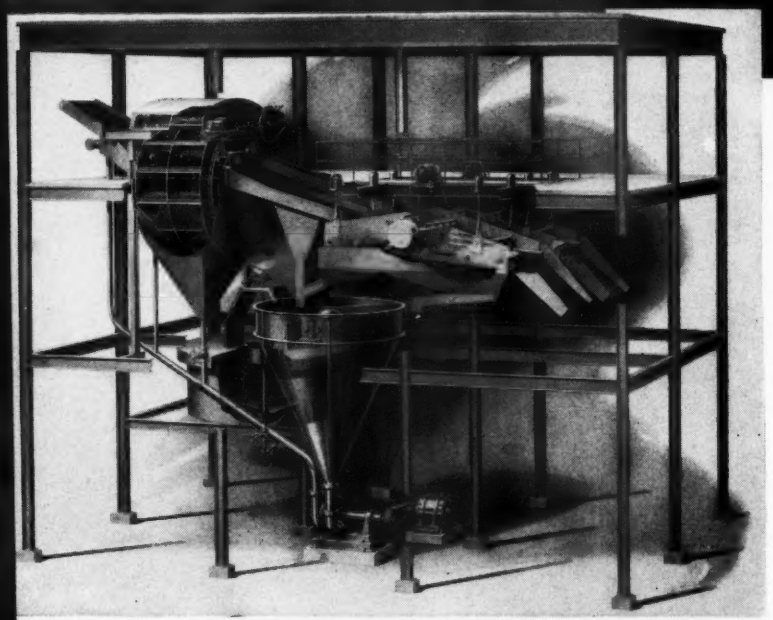
Mining CONGRESS JOURNAL

JUNE 1948

The LAST WORD in coal cleaning *for the "COAL MINES OF TOMORROW"*





The flow sheet above shows the paths of the coal and the heavy-media in the Link-Belt cleaning system featuring the Link-Belt Float-Sink Concentrator and auxiliary equipment. The drawing immediately above shows the concentrator, flumes, vibrating screens, thickener, sump, media circulating pump and storage cone. The lower illustration shows part of an installation in the Pittsburgh field.

*The Heavy-Media Separation Processes are licensed by the American Zinc, Lead and Smelting Company. American Cyanamid Company, 30 Rockefeller Plaza, New York 20, N. Y. are their sole Technical and Sales Representatives for these processes.

11,124

The new LINK-BELT Float-Sink Concentrator for Heavy-Media* Process

Examples of the fast growing popularity of the new Link-Belt Float-Sink cleaning method are:

(1) A cleaning plant of this kind is now being installed to replace a breaker recently destroyed by fire. This will be the first installation of its kind in the anthracite fields.

(2) A contract recently placed for five units in the West Virginia field.

(3) A repeat order to the original Link-Belt installation which has been in production on a commercial scale in the Pittsburgh district for over 2½ years.

The Heavy Media process, incorporating the exclusive Float-Sink Concentrator, cuts cleaning costs and improves coal quality. It makes sharp separations at predetermined and stable specific gravities of medium over a range extending as low as 1.25 sp. gr. It handles large coal reducing the necessity for manual picking. It requires only one operator. It can be started and shut down quickly and easily without loss of operating efficiency. The operating and maintenance costs are low.

Link-Belt Float-Sink Concentrator Book No. 2101 presents pictures and data on this new process. We'll be glad to send you a copy.

LINK-BELT COMPANY

Chicago 9, Philadelphia 40, Pittsburgh 13, Wilkes-Barre, Huntington, W. Va., Denver 2, Kansas City 6, Mo., Cleveland 13, Indianapolis 6, Detroit 4, St. Louis 1, Seattle 4, Toronto 8.

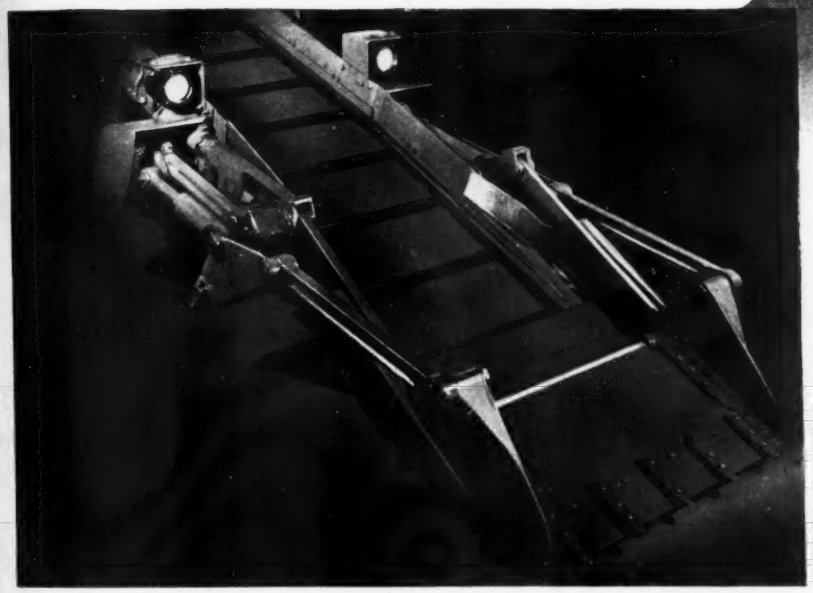
Send for This New Book No. 2101

COAL PREPARATION AND HANDLING EQUIPMENT

Engineered, Built and Backed by LINK-BELT

As an Operating Man I know from Experience...

THE SMOOTHEST, MOST DEPENDABLE LOADING ACTION IS THE NATURAL "AUTOMAT" SHOVEL ACTION!



Right you are. Mining men who have used the "Automat" know that the smooth natural shovel action of the Whaley "Automat" has definite advantages for efficient loading of all material, be it coal, rock or slate. First, no matter how fragile the coal, you can load it without degradation. Second, no matter how tough the rock work the "Automat" can handle it just as well as coal. Lifting and loading at the rate of 45 to 50 strokes per minute the "Automat" never fails to clean up quickly and completely any material it may be loading. Furthermore, the "Automat" shovel action means safe loading in close places. For complete loader service, investigate the shovel action and other outstanding features of the Whaley "Automat." Myers-Whaley Co., Knoxville 6, Tennessee.

Remember, the "Automat" loads, in its stride, any lump of coal that will pass through your tipple or any lump of rock your cars, aerial tram or larries can take.

Mechanical Loaders Exclusively for Over 40 Years.

Myers Whaley

the Torque Converter makes the Difference

When it comes to bulldozing there's nothing like a torque converter equipped HD-19 and Baker Bulldozer. The Torque Converter makes all other bulldozers obsolete — provides faster operating cycles, more operator comfort and efficiency, and greatly increased yardage at greatly reduced cost per yard.

And there's nothing like a Baker Hydraulic Bulldozer to go with the HD-19. Simplified engine mounting, sturdy construction, five stage blade tilt positions, plus the reliable fast-acting Baker hydraulic system, all contribute to the increased yardage a Baker will produce.

BAKER MFG. CO., Springfield, Illinois

LESS SHIFTING

Forward and reverse is all the operator is concerned with. All other speeds are automatic — the torque converter *automatically* selecting the highest speed in relation to the load. No other tractor — on tracks or rubber can match it.

HIGH REVERSE

Extra high reverse acceleration enables the HD-19 Bulldozer to cut operating cycles drastically. You don't require two-stage shifting to get into high reverse as on all other bulldozing units — the HD-19 reaches top reverse speed almost instantly and automatically.

FAST FORWARD

Forward travel speed is determined by the load — not the operator. The torque converter automatically adjusts the travel speed in relation to the load being handled — always the *highest* speed forward the load will allow. Cuts minutes from the operating cycle.

EASY ON EQUIPMENT

The cushioning effect of the fluid drive torque converter absorbs the shocks of tough operations. There is less strain and wear and tear on hydraulic systems and cable control units — and it's much easier on tractor parts as well.

SIMPLIFIED CONTROL

With shifting practically eliminated, the operator has only one control to watch — the blade control. He does more work, faster and better and is just as fresh at the end of the shift as when he started.

BAKER

BAKER They Go Together! AC

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Contents

VOLUME 34, NUMBER 6 FOR JUNE, 1948

FRONT COVER—Aerial tram for slate disposal from cleaning plant of Eastern Gas and Fuel Associates.

THE AMERICAN MINING CONGRESS
1102 RING BLDG., WASHINGTON 6, D. C.

HOWARD I. YOUNG, *President* — DONALD A. CALLAHAN, *Vice President* — ANDREW FLETCHER, *Vice President* — JAMES D. FRANCIS, *Vice President* — JULIAN D. CONOVER, *Secretary*

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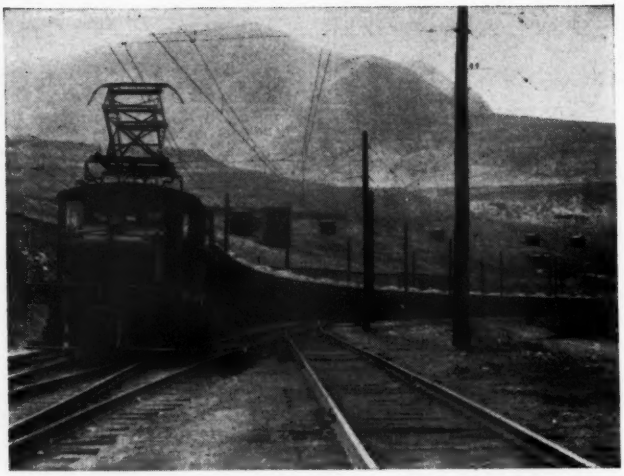
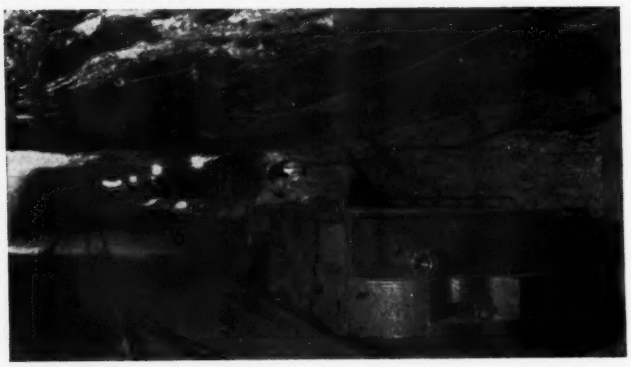
Member Audit Bureau of Circulations.

MORE PROFITS with Trolley Haulage



All Types of Load Conditions may be met with electric trolley haulage from a few miles of underground rockways to the mammoth open pit operations shown here. More than 6,000 big cars of ore and waste are hauled daily by electric locomotives in the large open-pit copper mines of the United States.



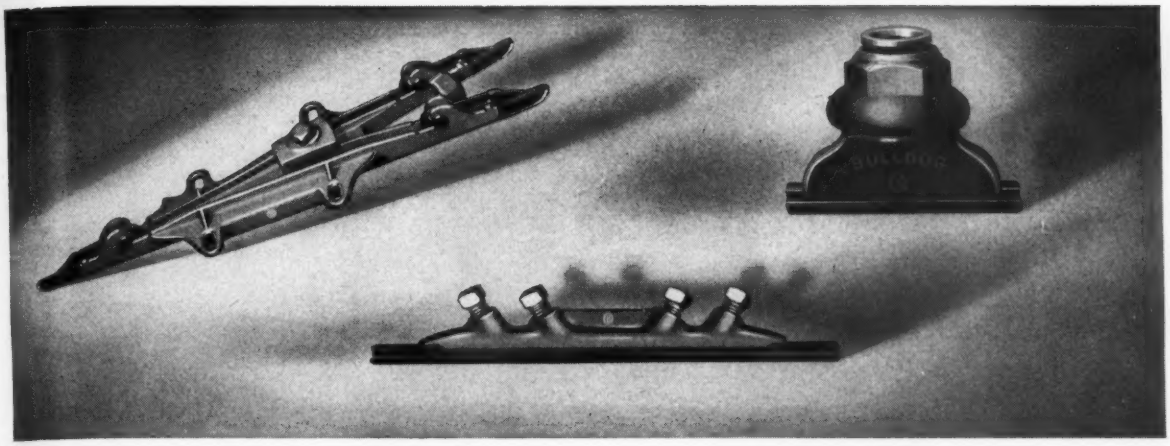
Doing Double Duty the trolley system carries electric current throughout the mine to operate other necessary mechanized equipment. Thus the same efficient power system is used to power pumps, fans and mining machines as well as haulage motors.

Completely Reclaimable O-B trolley materials may be pulled out and re-installed elsewhere after a mine section or level is worked out. Always ready for duty, trolley haulage has no limitations placed upon it as far as continuous service is concerned.

Electric trolley haulage means more profitable haulage. With millions of tons of ore to be moved, tonnage must be handled quickly and continuously if peak production is to be maintained at rock-bottom cost. The ability of trolley haulage to fill this bill is being proved at modern mining properties the world over. Using dependable electric power in its most efficient form, trolley haulage is always ready for duty. All types of loads can be handled from high-speed main haulage to slower gathering operations.

Adding to the success of trolley haulage are O-B overhead line materials. Designed by men in the mining business, O-B overhead devices are the accepted standard for mine trolley and feeder systems. When you build with O-B you can be certain you are getting correct design, ample mechanical and electrical strength, and extra service life — those qualities which spell dependability and top performance.

Pictured on the opposite page are a few standard devices which can insure the efficiency of your trolley haulage system. For a more complete selection, consult the O-B No. 22 Catalog. If you do not already have a copy of this handy buying aid, send for one today. Make certain you are getting the most out of your trolley haulage system by making O-B your headquarters for dependable trolley line materials.

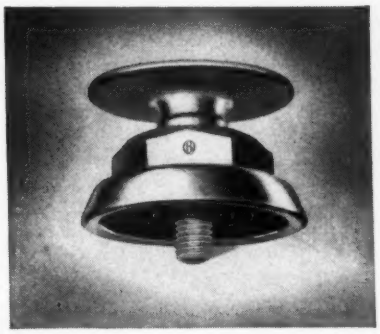


Trolley Frogs. For trolley wires smaller than 6/0, buy the Type-D, a cam-tip frog which is especially easy to install. Pan offers smooth underrun for collectors and sides flare at ends to direct shoe or wheel. A deflector bar between branch arms prevents collector wedging in case of dewirement. Available as right or left-hand frog with either short or long cam tips in 20°, 15° and 8° angles. 15° and 20° can also be furnished in V frogs.

Trolley Wire Splicer. Your collectors will "ride through" the Bulldog splicer and never know it's there. No wire encircling bumps to cause arcing; the Bulldog grips the wire by the top lobe only. Made of high-strength bronze alloy, splicer holds wire by means of four set-screws, angled to prevent slippage. Can be depended upon to hold permanently up to breaking strength of either copper or high strength bronze wires.

Trolley Clamp. Standard in mines throughout the world, the Bulldog Trolley Clamp features strong clamp jaws which grip the wire tight. Ample clearance allows free passage of current collector without arcing or burning. Requires only one man to install as large head nut, easily gripped with wrench, controls opening and closing of clamp jaws. Available for wide range of sizes.

Expansion Bolt. Attach mine hangers directly to the roof with Type-A3 Expansion Bolts. They hold tight in place and will support even the heaviest loads. Shell and expansion plug are made of malleable iron, stud of steel; all parts are hot-dip galvanized.



Universal-2 Mine Hanger. Convenient to use and stock, the Universal-2 may be attached to either the mine roof or lagged to a timber. A broad bearing surface at the top makes this hanger very rigid when installed, a desirable feature for curve work.

Air-Gap Hanger. Best to use in wet or dusty locations where surface leakage is a problem. Cutaway view shows air-gap principle which provides additional leakage surface and prevents accumulation of a conducting layer between outer shell and stud. May be attached either to expansion bolt or to the end of a 1¼-inch pipe.

Ohio Brass

MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd. Niagara Falls, Ontario

2818-M

OHIO BRASS COMPANY • MANSFIELD, OHIO

Yes, I would like to have a copy of the O-B Mining Catalog, No. 22. Please send me one by return mail.

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Cable that

Can't Be Bothered!

EXCLUSIVE ANACONDA BREAKER-STRIP construction and *adhesion* between jacket and insulation that makes a solid block around conductors, combine to make Securityflex* Parallel Mine Cable first in safety because it is *crush-resisting*.

Breaker strip guards against shorts!

That isn't all. Neoprene jacket protects against flame and is highly resistant to both tearing and abrasion. Securityflex mine cable won't kink or twist . . . stands up longer under severe abuse and extreme overloads. Cable meets Bureau of Mines Flame Test and diameter specifications.

Put a length on trial. From then on, you'll always specify Securityflex. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

*Trade-Mark

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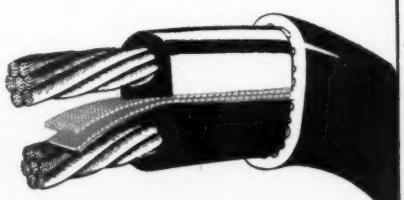


The exclusive Breaker Strip in Anaconda Parallel Mine Cable drastically reduces shorts between conductors. Available with or without ground wire.

ANACONDA *Securityflex* **MINE CABLE**

ANACONDA

DEVELOPED FOR MINES OF *Tomorrow!*

MECHANIZATION in the mines of tomorrow demands bigger, faster mine cars!

The mine car of tomorrow is this new a.c.f. 8-wheel Drop-Bottom car that hauls *12 tons* of coal smoothly, rapidly!

They're fast-rolling, too, with anti-friction wheels all around. At the dump, the 4 big, automatic doors open, dump and latch in seconds, without even stopping the trip. Empties speed back to the loaders minutes sooner.

These cars made for future streamlined operations may be able to solve your coal-hauling problems *now*. Ask your a.c.f. Sales Representative to explain their many features to you.

American Car and Foundry Company, New York · Chicago Cleveland · Washington · Philadelphia · Huntington, W. Va. Berwick, Pa. · Pittsburgh · San Francisco

a.c.f. **MINE CARS**

for Greater Coal Output

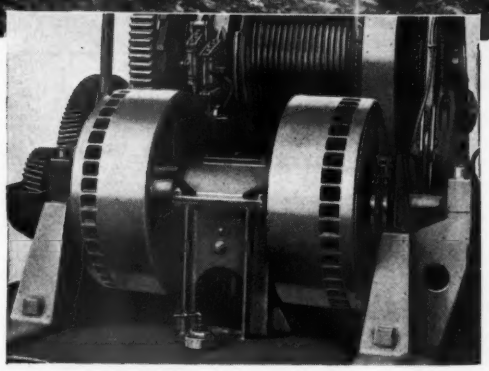
SWING FRICTIONS ARE *OUT*

THE MAGNETORQUE'S *IN*

P&H 1055 owned by Lytle-Amis-Green at Potholes Dam, Columbia River Irrigation Project. Nine million yards of rock and dirt will make this the 4th longest dam in the U. S.

It's the downright simplicity of the P&H Magnetorque that makes such a big difference in overall operation. It makes swing frictions obsolete — puts an end to high maintenance costs — eliminates routine adjustments that normally rob machines of productive time.

The Magnetorque handles all swing motions electro-magnetically — yet without big motors or tricky, complex electrical equipment. It's simple, dependable, trouble free. And it's smooth — with fast, velvety starts and stops. No jolting and jarring to strain the swing assembly or other parts of the machine. Ask us to tell you where you can see one at work.



THE P&H MAGNETORQUE UNIT transmits power for swing electro-magnetically without mechanical contact between driving and driven members—without friction, without wear. It lasts the life of the machine.

P&H

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HARNISCHFEGER
CORPORATION
EXCAVATORS · ELECTRIC CRANES · ARC WELDERS · P&H · HOISTS · WELDING ELECTRODES · MOTORS

Maximum Power . . . Minimum Weight

Maximum power . . . 275 horsepower in 743 cubic inches of displacement in a compact engine. Minimum weight . . . only 10.36 pounds per horsepower.

Faster work cycles and extra payloads result from this increased horsepower, low weight and compact design. The Exclusive Cummins Fuel System and other tested features of the Cummins line combine to make Series NH engines a high point in the modern diesel trend.

The supercharged Cummins Model NHBIS-600 is rated at 275 hp maximum at 2100 rpm . . . Model NHBI-600 is rated at 200 hp maximum at 2100 rpm. These engines are working on jobs like yours, near you. Ask your Cummins Dealer for actual operating records.

CUMMINS ENGINE COMPANY, INC. • COLUMBUS, INDIANA

● *Built by* THE JEFFREY MFG. CO., *these two Exhaust Type Aerodyne Fans are installed in parallel, each with its own motor and drive. One fan can act as a standby unit of the other, or both fans can be operated simultaneously.*

THAT MINERS MAY BREATHE

If there's any place where bearings *must* be dependable, it's on fans that provide mines with adequate ventilation. Because SKF Spherical Roller Bearings are dependable, Jeffrey engineers for years have selected them for Aerodyne fans. They know that "SKF-equipped" is another way of saying "trouble-free performance . . . rolling alignment . . . high capacity . . . only infrequent lubrication." The SKF trademark on a bearing is your guide to dependable performance, too.

6431

SKF INDUSTRIES, INC., PHILA. 32, PA.

Power to Your Order

39 *Working* Horsepower

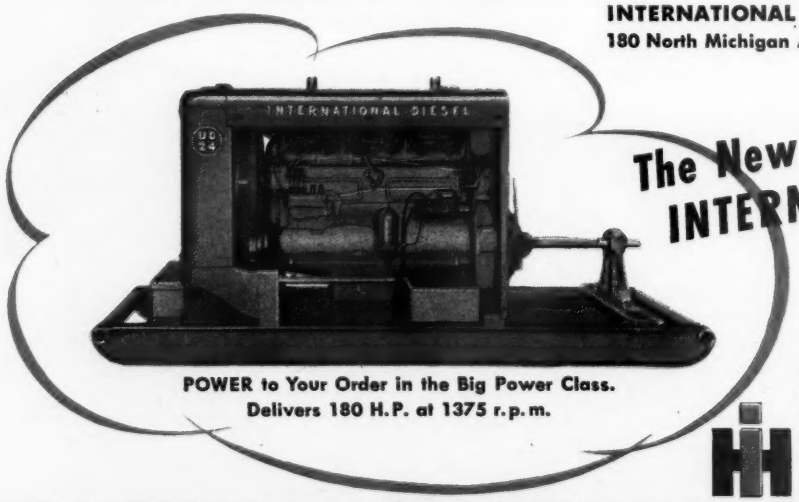
That's what this International UD-6 Diesel Power Unit delivers at 1500 r.p.m. A self-contained starting system permits hand cranking or use of an optional 12-volt electric starter for easy starting regardless of weather.

The UD-6 is a 4-cylinder, 4-cycle, valve-in-head engine with advanced design fuel injection, thermostatically controlled cooling, full pressure lubrication, sensitive variable-speed governor with torque control, renewable element oil filters, a large capacity oil-bath air cleaner and all the other typical International features of construction and design that make International engines superior for heavy-duty powering.

INTERNATIONAL Engines and Power Units are available in a range of sizes that makes delivery of *POWER to Your Order* a simple matter! Simply choose from the International line of *four* carburetor-type and *six* Diesel power units. That's the way to be sure of getting the full rated horsepower, the matchless operating economy, the dependability and long service life which Internationals deliver. The horsepower range is from 22 to 55 H. P. for carburetor models and 39 to 180 H. P. for the Diesels.

Let your International Industrial Distributor help you select the power and equipment you need. He can show you why it's *good business* to standardize on Internationals.

Industrial Power Division
INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue • Chicago 1, Illinois



POWER to Your Order in the Big Power Class. Delivers 180 H.P. at 1375 r.p.m.

The New 180-Horsepower INTERNATIONAL DIESEL

The UD-24

This giant of power is a complete, closed-type, independent, portable power plant that starts at the touch of a button. Its full-Diesel engine cannot be matched in its power class for economical and dependable performance. Ask your International Industrial Distributor for the complete story on this new International Diesel.

INTERNATIONAL *POWER*

CRAWLER AND WHEEL TRACTORS • DIESEL ENGINES • POWER UNITS

Proven Facts

CARSET JACKBITS

- Drill Faster
- Save Powder
- Boost Tonnage
- Reduce Maintenance
- Wear Longer
- Rotate Freely

EXCLUSIVE Ingersoll-Rand

Jackstud attachments are setting new standards in rod life. For best results use them with the remarkable new alloy drill steels, made to Ingersoll-Rand specification 139.

Features

Carset Bits *are field proven* . . . . From Maine to Texas, from Washington to Alabama . . . . Carset Bits are working, shift after shift, in hard rock and in soft, on Dams, Quarries, Tunnels and in Mines . . . . *Everywhere* its the same story . . faster drilling, deeper rounds, longer feeds, *lower costs*. In ground where steel bits are drilling *two to ten feet per bit usage*, Ingersoll-Rand Carset Jackbits are averaging *two hundred to more than a thousand feet*. They are the talk of the Industry.

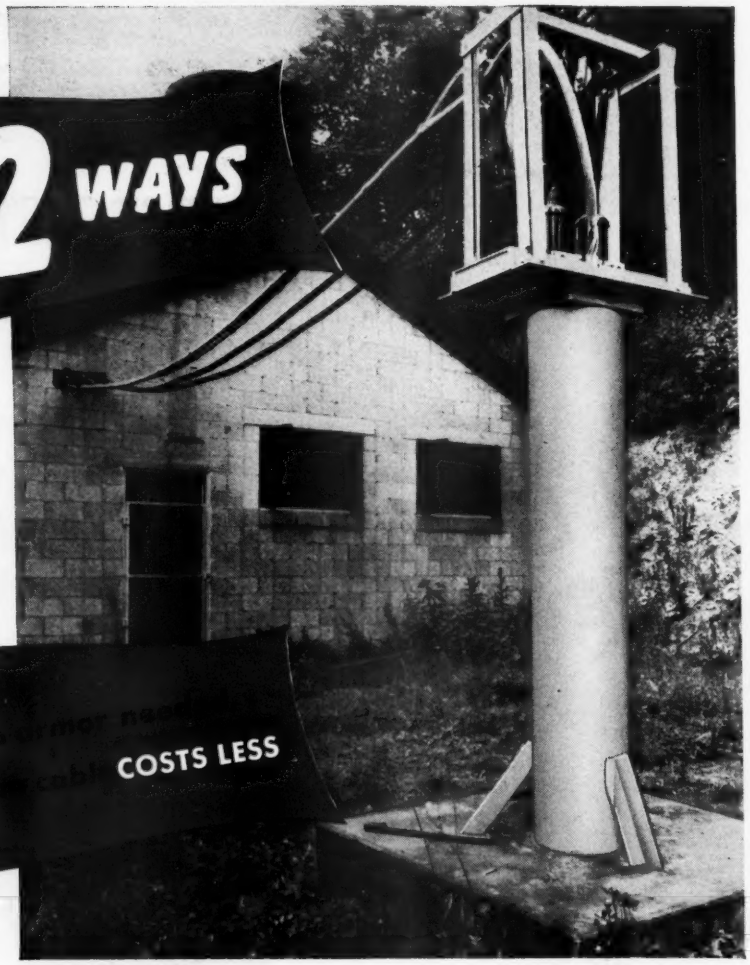
Buy Ingersoll-Rand Carset Jackbits with confidence, team them up properly with the correct Ingersoll-Rand Drifters, Stopers, Jackhamers and Wagon Drills for highest overall efficiency. They are designed, built, sold and serviced by men who know rock drilling.

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

YOU SAVE 2 WAYS

with insulated aluminum cable in bore holes



LIGHTER WEIGHT— COSTS LESS

YOUR SUPPLIER HAS IT!

Because aluminum is lighter than copper, you can replace heavy armored copper cable with unarmored aluminum cable and save money.

You save, not only by eliminating the cost of the armor, but because of the lower cost of the aluminum conductor itself. A 500,000 cm insulated aluminum cable, for instance, weighs *less than half as much* as an identical copper cable. That lighter weight means lower cost. Ask your wire and cable supplier about aluminum—get the facts!

When aluminum goes anywhere into your mine, wiring costs go down. Its lighter weight makes it easier to handle during installation. It needs fewer supports. It's easy to move. And it resists corrosion by acid mine waters.

Alcoa makes light, strong, conductive E.C.* Aluminum, which leading wire and cable manufacturers draw, strand and insulate, and sell under their own trademarks. Your wire supplier should have it in stock. ALUMINUM COMPANY OF AMERICA, 1764 Gulf Building, Pittsburgh 19, Penna.

*E. C.: *Electrical Conductor* Aluminum

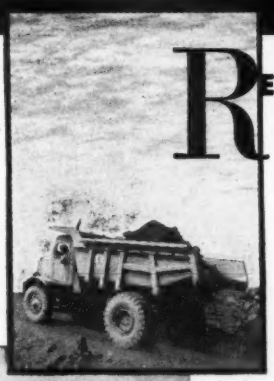
ALCOA EC ALUMINUM

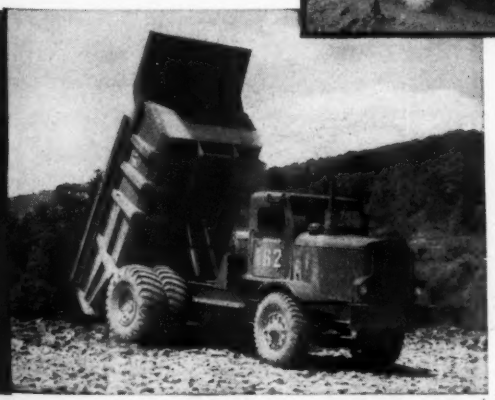
FOR ELECTRIC WIRE AND CABLE

You Get "Plus Performance" with EUCLIDS

(Above) Model TD Rear-Dump Euclid. 22 ton capacity... 14.8 cu. yds. struck measure... loaded top speed 31.2 m.p.h. ... powered by 225 or 275 h.p. diesel engine.

(Below) Double-acting twin hoists and entire hydraulic system are of Euclid design and manufacture. Action is fast and positive enabling operator to control body position at all times.





REAR-DUMP EUCLIDS are engineered and built for lasting strength. Their ability to stay on the job, day after day, means more tons moved at lower cost... "plus" performance for owners.

Model TD Euclid body has extra thick plates reinforced with heavy box section side and bottom supports. The rugged frame is built to stand the jolts of hauling 22-ton loads. That's why it can take the pounding and wear of loading ore, coal, overburden, and heavy excavation by large shovels and draglines.

Some other "plus" features that make the Model TD Euclid unequalled for long-life and continuous performance are large capacity... ample power and traction for steep grades and tough roads... good speed on the haul road and full-floating, double reduction planetary type Euclid axle.

If you want economical operation and equipment best suited to your hauling needs, see your Euclid distributor or representative.

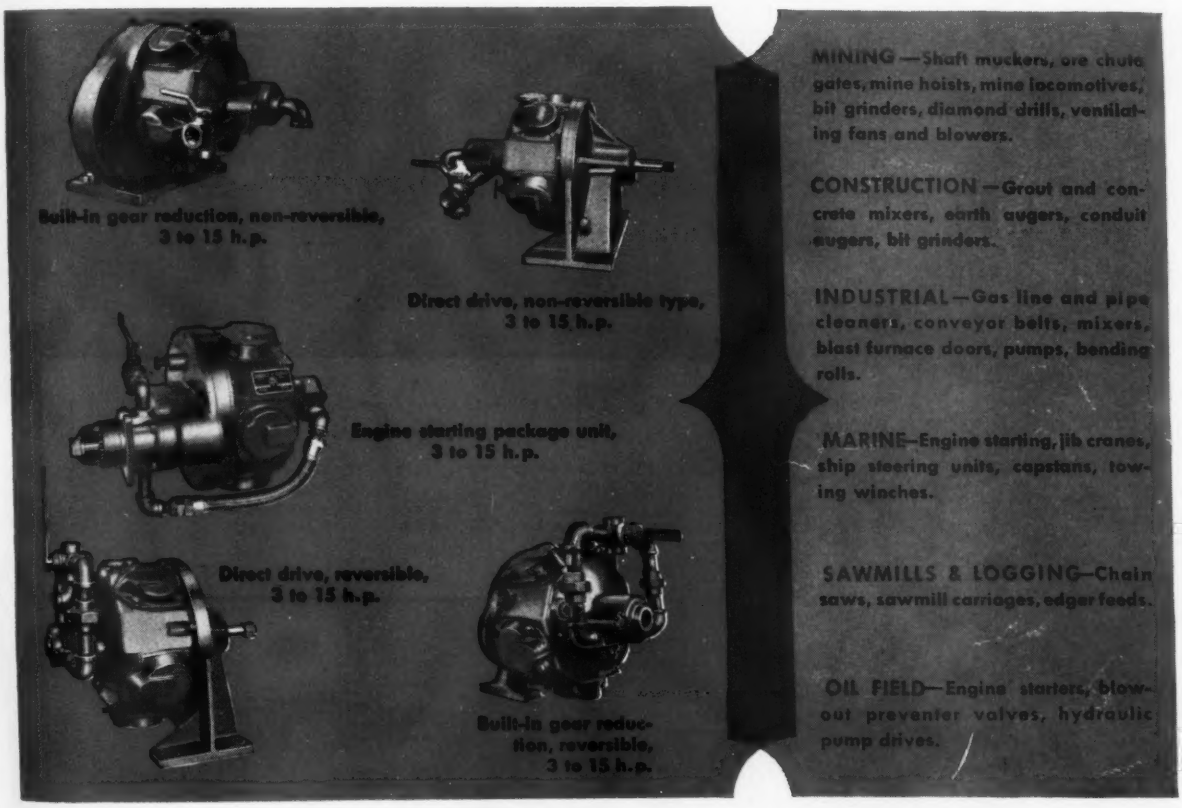
The EUCLID ROAD MACHINERY Co. Cleveland 17, Ohio

EUCLIDS

NO other kind of power excels *air* power in safety, flexibility, freedom from damage due to overloading, and simplicity of control. That's why Gardner-Denver air motors find such a wide application. These 5-cylinder radial air motors are remarkably compact. They can be controlled to operate at any desired speed up to their maximum r. p. m. They have unusually high torque for high starting loads. They are simple, durable and light in weight.

for greater flexibility, safety, convenience . . .

GARDNER-DENVER AIR MOTORS



MINING—Shaft muckers, ore chute gates, mine hoists, mine locomotives, bit grinders, diamond drills, ventilating fans and blowers.

CONSTRUCTION—Grout and concrete mixers, earth augers, conduit augers, bit grinders.

INDUSTRIAL—Gas line and pipe cleaners, conveyor belts, mixers, blast furnace doors, pumps, bending rolls.

MARINE—Engine starting, jib cranes, ship steering units, capstans, towing winches.

SAWMILLS & LOGGING—Chain saws, sawmill carriages, edger feeds.

OIL FIELD—Engine starters, blowout preventer valves, hydraulic pump drives.

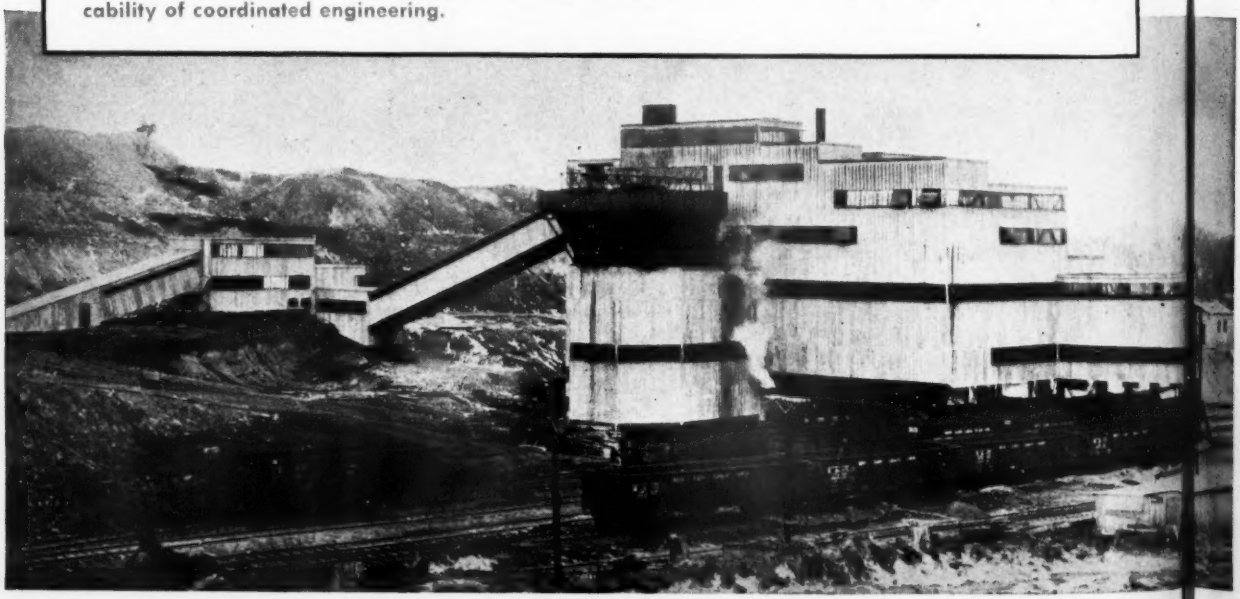
For complete information, write Gardner-Denver Company, Quincy, Illinois

GARDNER-DENVER SINCE 1859

FOR OVER SIX YEARS—a strenuous period for the coal industry—a smooth-flowing, low-cost-per-ton haulage system has contributed to the success of this strip-mine operation.

Millions of tons of coal have poured into an underground hopper, up out of the mine, through crusher and preparation plant and out into cars.

This system, using three U. S. Rubber conveyor belts, is but one of many examples of the practicability of coordinated engineering.



COST HAULAGE

can't help but result from coordinated engineering—teamwork between your mine engineer, your equipment engineer and the U. S. Rubber conveyor belt engineer. May we tell you more about this successful method of modern mechanization or about a replacement of your present belt?

Write Mechanical Goods Division, United States Rubber Company, 1230 Avenue of the Americas, New York 20, N. Y.

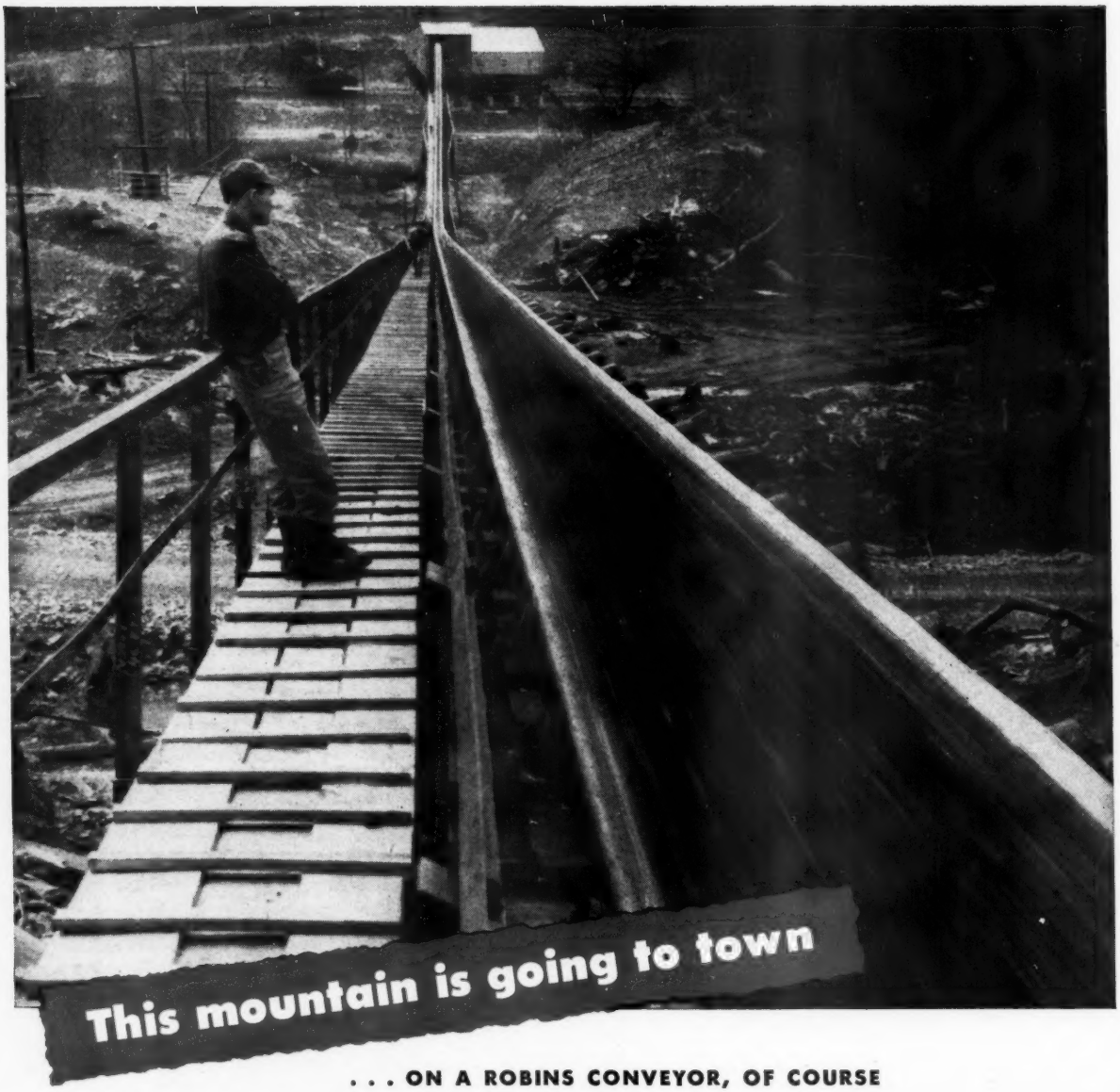
Underground belts as well as slopes and booms fit into the plan of coordinated three-way engineering, advocated by U. S. Rubber.

PRODUCT OF

U.S.RUBBER

SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY



This mountain is going to town

. . . ON A ROBINS CONVEYOR, OF COURSE

Down in West Virginia they're pulling Gauley Mountain inside out —extracting its valuable coal.

To do this, they have to bring the coal down a long slope, over a river and into a tipple nearly a third of a mile away.

Hewitt-Robins engineers designed one conveyor and belt to do the entire job. The conveyor moves the coal from an elevation of 2,565 feet to a tipple 249 feet below. *Every hour 250 tons can be carried 1485 feet at a rate of 312 feet per minute!*

To control the force of gravity on these enormous tonnages, a system of completely automatic centrifugal controls with regenerative braking was designed *to hold speeds in check and control the flow!*

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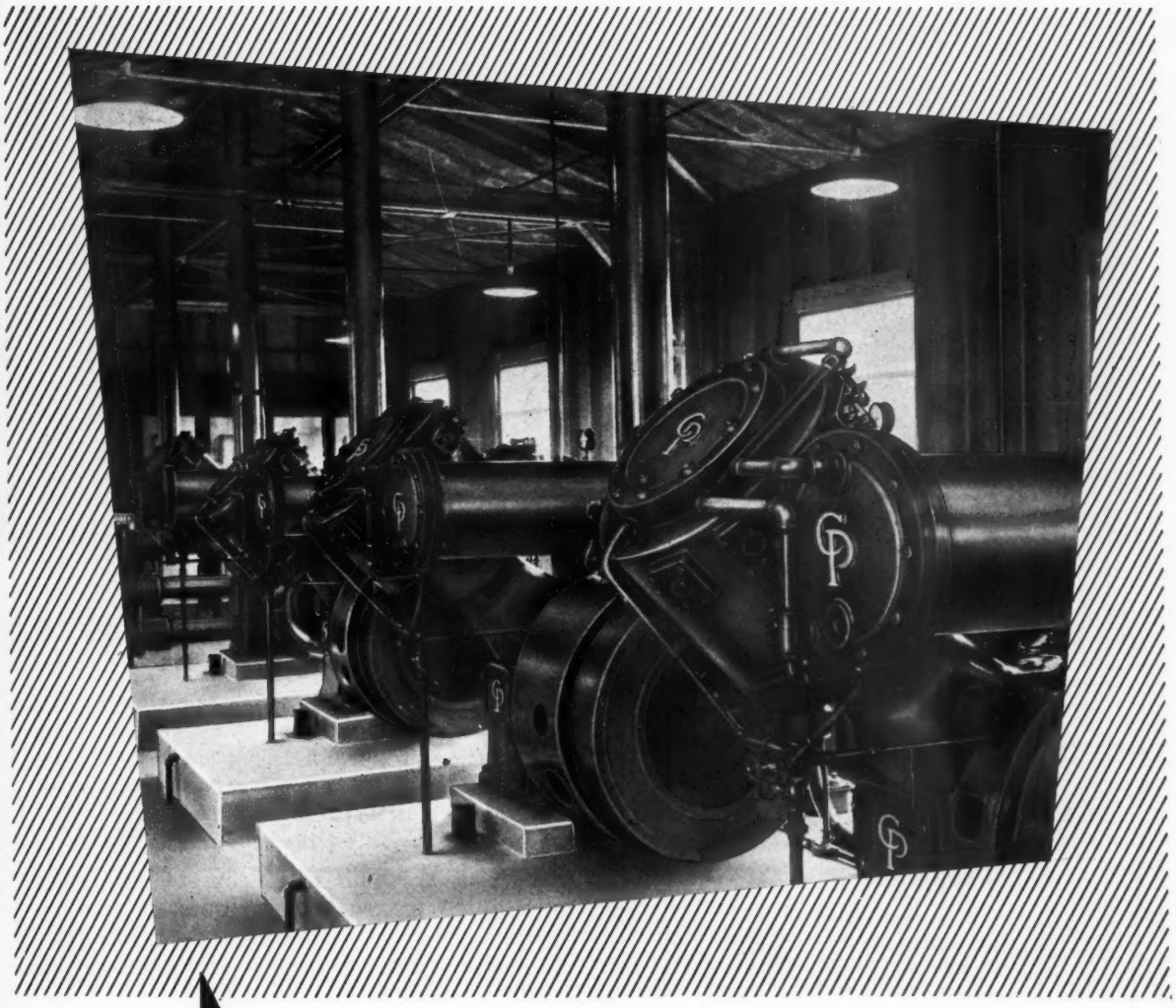

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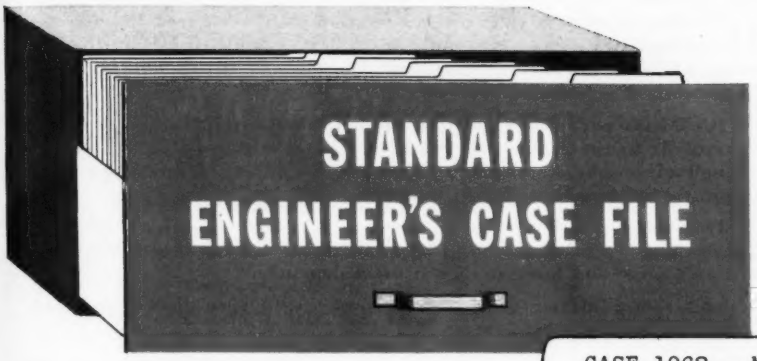
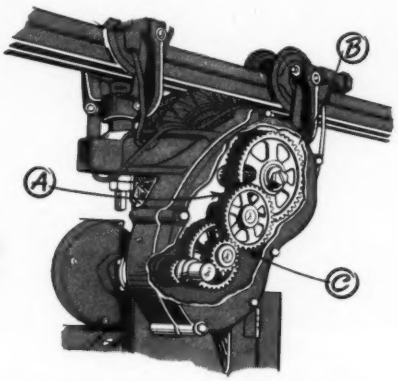


CASE 1062 -- MAINTAINING LUBE FILM ON HEAVY-DUTY GEARS.



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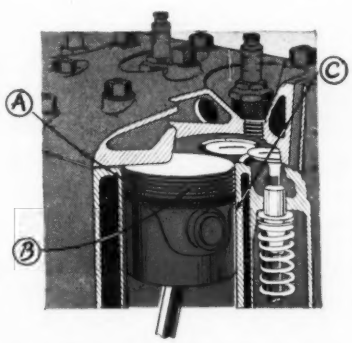

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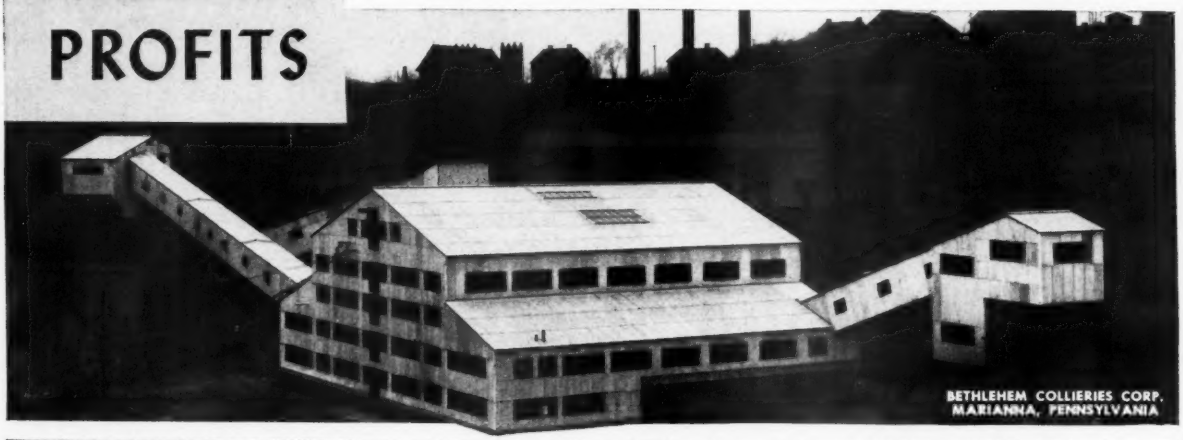

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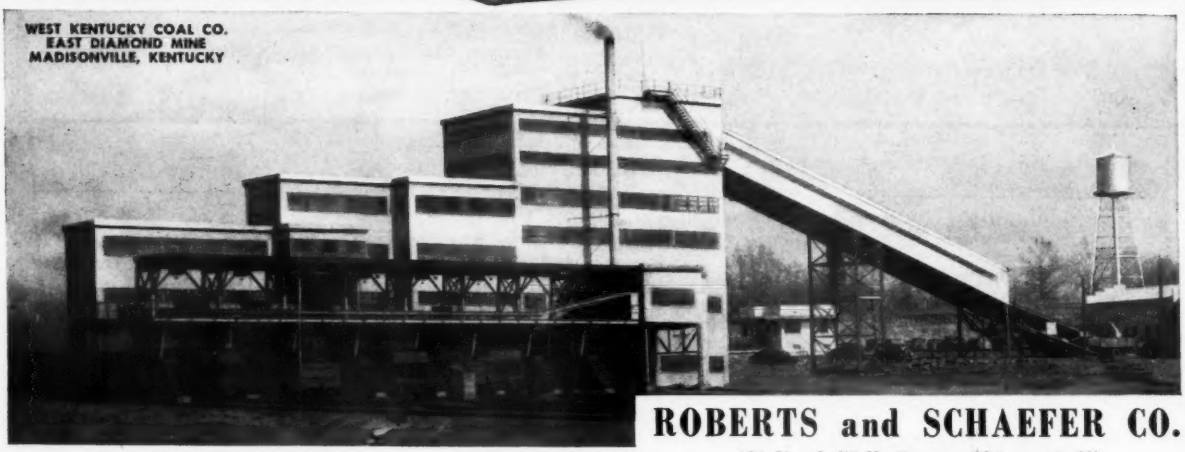

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Mining CONGRESS JOURNAL

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JUNE
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Who's Next?

SURGICAL dismemberment of the mercury mining industry, long a guinea pig among strategic minerals, has apparently been concluded. Following the virtual elimination of our domestic production, the Spanish-Italian cartel has now raised the price of quicksilver for the United States market by $2 to bring the current price to $54 a flask fob, exclusive of duty.

Evidence indicates that the tungsten mining industry is next on the list for liquidation. In the first week of May the tungsten market weakened and in the second week, when President Truman implemented the Geneva Treaty clauses reducing tariffs on tungsten from China and other foreign suppliers, imported tungsten was immediately offered at $18.50 fob New York and considerable amounts were sold. Including the new tariff of $6 per unit, this means a price of $24.50, duty paid, New York.

In the face of this reduction from the $27-$28 price that has prevailed, operators of domestic tungsten mines predict the shut-down of the industry within a few months except for a few captive mines, which may be operated at a loss by their industrial owners.

Measure for Measure

ON the threshold of a third round of intense pressure by labor unions to again increase wages, we might pause to feel the soreness of the bumps and bruises caused by previous wage increases, and to consider the possibilities of even further and more serious damage to our economy in the event of a successful third round.

By bullying and crippling use of the strike weapon, labor has managed to hold up industry for an increased share of the profits. Properly, wage advances should come out of profits. But the manner in which this is accomplished must be carefully proportioned to avoid cutting into the seed corn of profit which should be placed in savings or capital investments to increase productive capacity. The investment of profits in this direction makes for higher wages and lower prices.

Industrial operations must have continuity over a long period of years to assure jobs and make for a stable standard of living for employes and consumers. Taking all the years, good and bad from 1909 to 1946, corporate profits, after taxes, averaged only 6 per cent of national income. This is an insufficient cushion to carry through the lean years, to provide for increased productive capacity, and for replacement of obsolete equipment.

By means of strikes and strike threats labor may realize a short-term gain and suffer a long-range loss in its attempt to take an additional bite out of the funds which should be used for increasing capital investment to permit increases in the "real" hourly wage earnings of labor.

Every vociferous pressure group has been out to get "theirs" with resultant bad effects upon the Nation as a whole. A highly significant analysis of what has happened to various groups, by way of changes in weekly "real" incomes since 1939, appeared in the *U. S. News and World Report* of May 7, 1948. It shows that the net effect for most groups of workers, in "real" income since war end, has been either a modest gain or actual loss. Three years of turmoil and strikes have marked up wages, salaries, and price tags but, except for a few groups, the net addition to living standards has been small.

Bituminous coal miners, benefiting from the maneuvering and upheavals created by John L. Lewis, are the major beneficiaries. Expressed in 1939 dollars, the average weekly pay of bituminous coal miners is $40.35 as compared with $23.88 a week in 1939. Textile and construction workers are, respectively, second and third in the group which experienced the greatest gain in "real" income.

Chemical, iron and steel, and food industry workers are within the group that experienced moderate gains. The white collar workers in the merchandising field, crude oil workers, automobile workers, and railroad employes have held their own in purchasing power. On the sadder side of the picture, insurance workers, government employes, and school teachers have suffered a loss of purchasing power as have veterans on compensation and retired Federal workers.

Right at the bottom of the column stand the bond holders, that important group whose capital investments are essential for providing the money to make for more producing capacity in order that labor may realize higher wages and lower prices.

Repeated sallies into the seed corn of business deter the investment of venture capital, without which new mines, machines, and methods to uplift living standards will not be available.

Measure for measure, prices have chased wages with no real over-all benefit to labor but with a consequent reduction of "real" capital available for investment. To a degree, income tax reductions now in effect will provide some additional capital. But if invested capital is to continue to provide jobs and raise standards of living, the possibility of adequate returns from investments must be improved.

Coal Conservation

By JAMES BOYD
Director
United States Bureau of Mines

IN OUR resource development and extractive industries we have far too long neglected the conservation phase of our responsibilities to the public and the coal industry particularly has definite responsibilities in preserving, through conservation, a continuing source of energy for future generations. By conservation I do not mean that we should keep our coal buried in the ground, as is another great resource at Fort Knox, Ky., but I do mean that we should get it out of the ground as we need it, as completely and efficiently as possible, and use it in the wisest way that we know how or can devise.

In most instances, our wasteful coal-mining methods are based on the traditional assumption that our coal reserves are so ample as to be virtually inexhaustible. Although past practices of leaving large blocks of coal unmined are understandable, certainly in the light of current knowledge such procedures can no longer be condoned. We cannot continue to shy at attempts to get out the last practicable bit of coal. It is to the interest of both the producer and the Nation to see that maximum extraction is attained.

We hear more and more comments regarding the difficulties that certain companies are now having in locating new accessible beds of the right type of coal to continue their operations. Well known is the present-day struggle of some coke producers to find coal supplies with a sulphur content within the limits necessary for good steel-making practice. The most responsible quarters of the coal industry have long recognized that practical conservation measures pertaining to safety and accident prevention usually lower costs and improve operations. It takes comparatively little study of conservation measures to show clearly that the same principle applies to the development of mining methods that will extract a greater proportion of our coal beds as they are being mined.

Aim at Maximum Extraction

The past practices of "skimming the cream" in the mining and use of our coal have arisen from many temporary considerations. These include: (1) Concentrating on highest quality of coal—purest in the sense of being lowest in ash and sulphur and of which the supply is relatively scarce; (2) concentrating on deposits in fields which are nearest markets, regardless of the rank and special properties of coal; (3) concentrating on lowest coal cost beds—this is entirely justifiable economically but again the principle of wisest and most suitable use must be given more consideration.

Because of competitive conditions in the United States, American coal mining engineers are striving to reduce operating costs rather than to increase maximum recovery from the bed. The principle of maximum economic return has ruled, and this is primarily influenced by wage rates and the competitive price of coal. In the United States, where wage rates are high and coal-in-the-ground costs are usually low, engineers have found little incentive to save coal and to seek maximum recovery. Mining laws set standards of safety but there are none governing the degree of extraction. Although the incentive to maximum recovery obviously exists, competition requires the greatest emphasis on daily output at lowest cost.

With the improved outlook for coal, the time has come for universal thought and action on research and the application of practices for maximum recovery. In the mining of coal, we should strive to eliminate the staggering and no-longer-defensible losses. A good cooperative start has been made by the Bureau and industry in the anthracite field. Conservation demands that like measures be followed in the bituminous field.

★ ★ ★

More Complete Extraction of Coal from Beds Now Being Mined and Safer Mining Practices Are Steps Toward True Conservation

★ ★ ★

Recover Boundary Coal

The case against the losses of valuable coal in mining practices can be built up to a much greater degree, but the conclusions and the need for action are clear. One further source of avoidable losses is somewhat indeterminate, but it is certainly large in the aggregate; losses through premature abandonment of both irregular areas near the end of beds or near boundaries. Theoretically, these pieces of virgin coal—often of highest quality—could be later reopened and mined. Actually, however, because of irregularity, size, isolation, disrepair and collapse of workings, the new opening facilities are uneconomic; yet, during the active life of the original mine, the additional cost of recovery would have been relatively small. Naturally, many instances of these losses by abandonment have resulted from mine financial conditions following the period of high-price (for coal) that prevailed from 1916 to 1922. It was reported that 4802 such cases of shut-down mines occurred in the period of 1923 to 1932. Only a few

had been worked out, and few, if any, can be rehabilitated. From the standpoint of public good, this, we see most clearly, is not conservation.

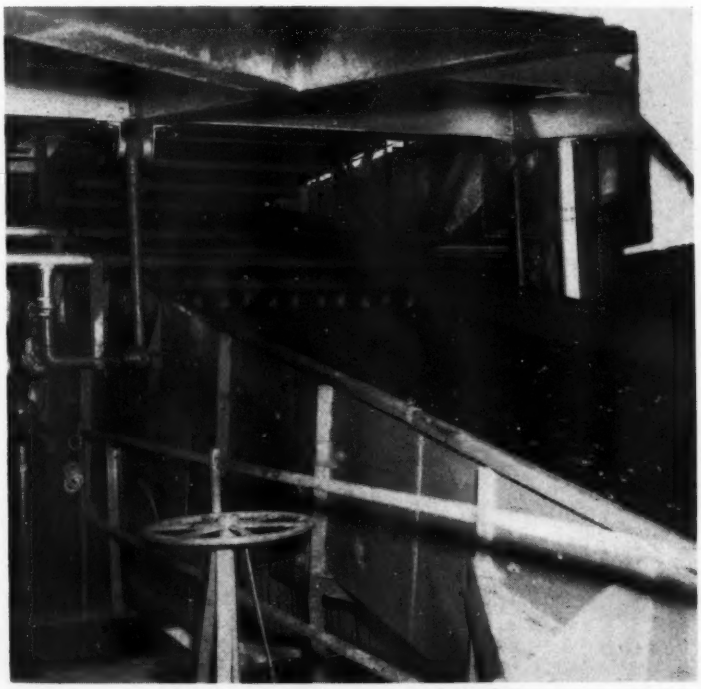
An anthracite laboratory is being constructed at Schuylkill Haven, and it is hoped it will be in use within the next 18 months; pending construction of the building, a number of investigations are continuing. In addition a bill is now pending before Congress for the appropriation of approximately $560,000 for an engineering study into the water problems in the anthracite region.

Research Promotes Increased Recovery

Mechanical mining research has gained favor with the industry and the Bureau is making every effort to meet the demands upon it for services. The objective in mechanical mining research is to improve mine operation by introducing machinery and methods especially suited for anthracite conditions. New equipment has been designed, and certain European machines, modified for local use, have been introduced. It has been found, for example, that mechanical chain-cutting of gangways in steeply-pitching beds will double the rate of advance over hand-mining methods, reduce the amount of roof-trimming for the miner by providing a more secure top, and, through the use of conveyors, eliminate the blasting of wall rock for clearance. Lightweight German shearing machines, imported by the Bureau of Mines in 1946, have been fully tested and are now undergoing slight changes in design to make them even more suited to anthracite pitching-bed conditions.

The loading machine for thin, steeply-pitching beds was designed, constructed and tested by the Bureau. Its use eliminates transportation delays in driving gangways, and tests show that several times the best day rates of advance are possible with this machine. One of the principal developments in the German coal industry was the coal planer. Although this machine was used in friable soft-coal mines, it is expected that a vibrating blade can make the machine adaptable to anthracite operations; the Bureau is developing such a machine at the present time.

Fundamentally, low percentage of coal extraction may be due to (1) relatively thick beds, (2) excessively thin beds, and (3) properties of roof and bottom. In the past, the planning of a coal mine for maximum extraction has been inhibited by the factor of high costs. Does this factor apply today? If the total tonnage extracted from a mine is increased, the total fixed charges per ton would be reduced. The industry is faced with the necessity of opening new mines, usually in areas less favorably located with respect to transportation, topography and other essential features. However, if increased recovery can be obtained from mines in existing fields, the life of these present fields can be prolonged.



Modern preparation conserves fuel values.

Increased mechanization of mines has presented problems, especially the extraction of coals with mechanical equipment. The investment necessary to equip a mechanized mine is great, and in order to reduce the fixed charges per ton, the working area should be so planned that maximum recovery can be obtained for a given territory. The type of equipment used for mechanized mining, including equipment for pillar extraction, can be determined only after extensive studies of the physical conditions in and surrounding the coal beds.

Conservation Through Better Preparation

Another approach to the general objective of fuel conservation may be obtained through the application of preparation technology which may be directed to two broad channels of development.

First, and most obvious, there is the application of efficient coal preparation practices to recover the maximum fuel value from raw material now being mined. Conservation is effected by eliminating the losses of coal in gob material, mine rock dumps, and picking plant and washery rejects.

Second, there is the more difficult but much broader phase of upgrading mediocre or substandard coals to make them more valuable. Typical of such problems and of major importance are (1) improvement of coal from the high-sulphur areas of the Pittsburgh and western Pennsylvania seams to adapt it to metallurgical use—an accomplishment that would enormously increase the reserve of metallurgical coal in the area; (2) treatment of the western lignites to obtain a satisfactory domestic and industrial fuel—a preparation and processing project; (3) preparation and treatment of the high-ash rider coals associated with the Pittsburgh seam so that the entire coal bed may be mined and used.

There are many local situations where the solution of the preparation problems would greatly increase our supply of fuel. In many localities such developments would not only conserve the national fuel supply but would also furnish a more dispersed and dependable source of energy for general industrial use.

All phases of coal-preparation are being studied by the Bureau of Mines. In work with a cyclone and with a kerosene flotation process the Bureau has shown how to recover usable coal from washery waste. Studies of operation of these processes for commercial preparation has led to fruitful suggestions for their improvement. Also, fundamental studies have been conducted to provide data essential to the development of new preparation techniques.

One of the greatest contributions to

conservation is through improved coal utilization. These contributions of the Bureau through combustion research are many and of classic nature. They include fundamental studies on burning coal most efficiently in hand-fired as well as in different types of stoker-fired and pulverized-coal-fired furnaces. Likewise, the published coal carbonization studies made by the Bureau are a valuable source of information on the carbonizing properties of American coals, the only difficulty now being that it has not been possible to conduct test work as rapidly as the needs for new sources of coking coals have developed. We have proposed to expand these carbonization studies to include work on upgrading and blending poor coal with high-quality coking coals as a means of conserving and extending the use of the remaining scarce, high-quality coking coals.

Although this country has made and still is making mistakes in the use of coal, as our new horizon of knowledge now tells us, the record in this respect is far more satisfactory than our record concerning mining losses.

Manpower Conservation

No discussion on conservation measures is complete without reference to the conservation of manpower through safety measures. It has long been recognized by responsible units of this and other industries that safety pays. There are numerous examples of the fact that the costs resulting from unsafe practices vary inversely to the number of dollars and amount of constructive effort spent on safety measures. For many years the Bureau has advocated the application of rock dust in bituminous-coal mines to prevent the propagation of explosions, and this approach has been widely recognized by the industry. Nevertheless, too many mines continue to be inadequately rockdusted. In some mines rockdusting has been applied to entries and other easily accessible openings, but little, if any, has been applied to the less accessible places such as back entries, air courses and rooms. Partial rockdusting provides a false sense of security because if an explosion of gas or dust occurs in a bituminous-coal mine it will follow the path of least resistance and propagate through mine openings where rock dust is lacking or is inadequate.

The efficacy of rock dust in preventing the propagation of an explosion has been proved in numerous instances. Recently an explosion occurred in the section of a bituminous-coal mine that had been vacated only a short time previously by workmen who were in a man-trip en route to the surface. The haulage road and open parallel entries were well rock-dusted; unquestionably the rock dust quenched the explosion and prevented it from reaching the workmen, but extensive damage was done to the mine in the areas in which the explosion was propagated. Centralia No. 5 mine explosion in which 111 men were killed is an outstanding example of the high loss of life resulting from the propagation of an explosion through passageways not rock-dusted. Although this example was spectacular and widely publicized, there still remain far too many mines that have not recognized the dangers of inadequate protection from this menace. Federal inspection reports continue to indicate that far too many mining companies are continuously ignoring this principle.

Although the Federal inspection reports are posted at the mine and transmitted to management and labor and reported to the press, in some areas this procedure has not seemed to have been completely effective. Consequently we are now inaugurating a more comprehensive system of following through. We are reporting to the State Mine Inspectors directly all those mines which continually fail to comply with the fundamental violations of safe practices in regard to explosion hazards. At the same time we are picking out the worst hazards reported in Federal inspection reports and drawing them to the attention of the presidents of the companies, many of whom may not themselves recognize the dangers in the mines from reading the inspection report itself. We are also establishing other methods of following through the reports from the Federal inspectors.

There are other causes of explosions and preventive measures besides rockdusting that should be undertaken; these are included in the reports now being made. The prevention of disasters in mines rests chiefly on the shoulders of management. Failure to recognize and correct flagrant violations of safety provisions approaches irresponsibility. It is essential to the growth and well-being of the industry that responsible members of it assist the Federal and state authorities in insisting that all operations conform to fundamental safety measures in the prevention of accidents in coal mines.

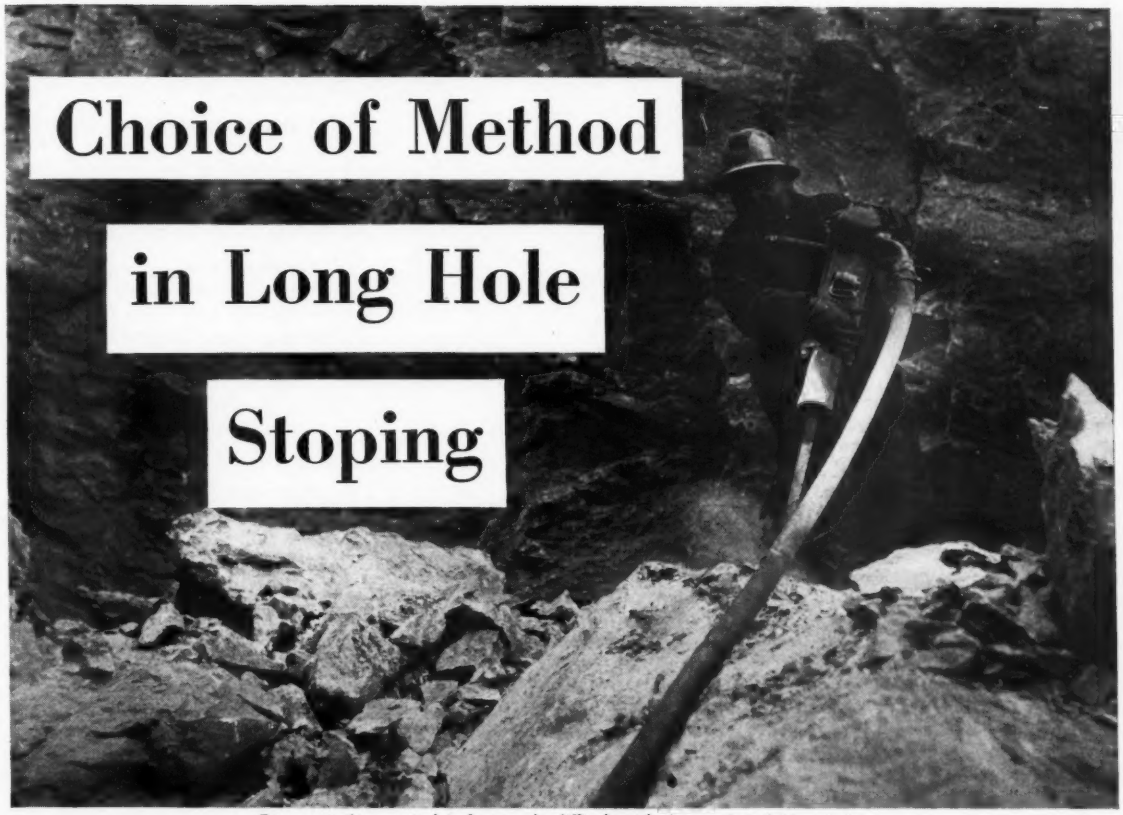
Education Is Safety

Innumerable accidents also result from day-to-day activities of the individuals working in the mines. Although management must provide the tools and supervision and discipline to maintain safe conditions in the mines, nevertheless much can be done in this direction through the individual workers themselves. To accomplish this, the Health and Safety Division is carrying on numerous educational activities devoted primarily to the prevention of accidents. This type of work has been done since the Bureau was brought into being in 1910. To intensify the Bureau's efforts in this direction the Coal Mine Inspection

(*Continued on page* 31)

Rockdusting prevents the propagation of an explosion.

Choice of Method in Long Hole Stoping



Fragmentation control is frequently difficult with diamond drill blast holes.

By FRANK A. TAFT
Mine Superintendent
Goldfield Consolidated Mines Co.

A comparison of the various methods of diamond drilling long holes for stoping offers operators a basis upon which the most applicable method for a given ore body may be selected.

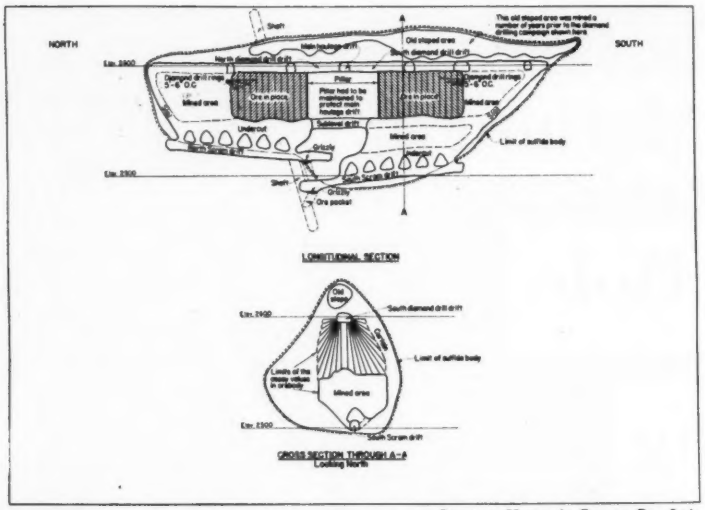
DIAMOND drill long hole blasting in stope mining is becoming more and more widely used where the benefits to be obtained from this practice can be realized. Considerable progress continues to be made in the diamond drilling field, and under certain conditions, some large and small ore bodies can be broken more economically by diamond drilling than by percussion drilling. A factor that has added to the rapid advancement of this method of stoping has been the shortage of manpower throughout the mining industry during the past few years.

Ore bodies most suitable for breaking by diamond drill long holes are large, have regular walls that do not cave easily, and can be mined by the open-stope method as open stopes with large free faces give the drill holes the best advantage possible in breaking the ground. Good walls that do not cave easily are essential in diamond drill long hole blasting in order to avoid the overbreaking and consequent dilution of the broken ore. Wall condition in some mines is the determining factor of the applicability of the method. Some ore bodies being shrink mined can be broken by diamond drill long holes. Also, it is possible to break successfully with long holes narrow veins having strong walls.

There are several distinct methods or drill hole patterns most commonly used that have worked out satisfactorily in ore breaking. However, in some cases a combination of vertical, horizontal, and angle holes are used in order to break the rock from a particular drill set-up or bench.

Parallel holes may be drilled from benches in a method commonly known as the Aldermac bench. These holes may be vertical or on the dip of the ore body but are drilled parallel to each other. In this method a bench from which the holes are drilled is cut above the back of the undercut or open stope. The elevation of the bench above the back of the open stope, width of the bench, and burden on the holes is entirely governed by the characteristics of the ore body and the previous experiences of the mine staff with similar benches.

In the ring method, frequently called the Noranda ring, a drill is set up in a drift and a ring of holes are drilled in a plane from the drift. This drift may be located in the center of the ore body from wall to wall, in which case a complete ring over the 360 deg may be drilled. Drifts may be located on each wall of the ore body



Courtesy Mountain Copper Co., Ltd.

Diamond drilling the Mattie orebody, Shasta County, Calif.

either on the same elevation or staggered on each wall according to a decision based upon local conditions. In this case only a partial ring is drilled from each drift. This latter method is most commonly used for obtaining parallel holes at each wall to assure clean breaking of the ore at the walls. Dead ending of holes at the walls leaves an irregular wall. The frequency of boot-legs may govern the success or the failure of long hole blasting in stoping. The burden on holes and the drilling pattern is governed by the characteristics of the ore body.

Horizontal holes may be drilled from a slot cut in the ore body or in the form of rings from a raise or raises driven in the ore body. The pattern of the holes is governed by the outline of the ore body. Where it is desirable to stope an ore body by the shrinkage method horizontal holes are ideal.

Each diamond drill long hole method offers certain advantages and disadvantages.

Parallel holes (Aldermac bench)

Advantages

(1) Better distribution of ground per foot of drill hole consequently better powder factor and fragmentation

(2) Alignment of holes simpler especially on the vertical holes

Disadvantages

(1) Drilling on bench at edge of open stope

(2) May have large back presenting danger from rock slabs above

(3) Separate set-up required for each hole

Ring Method (Noranda rings)

Advantages

(1) Can drill many holes from one set-up

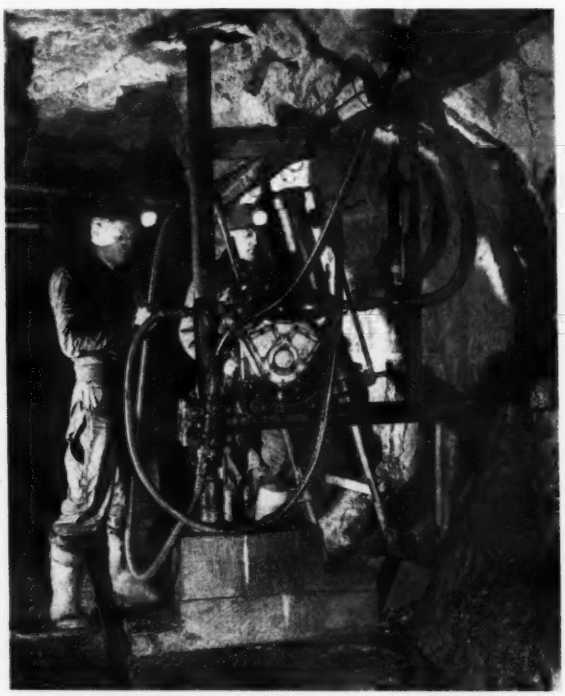
(2) Safer working conditions for drillers

(3) Considerable ore can be drilled out ahead of ore breaking if the ore body is not too blocky thus causing shifting of sections of drilled out ground after blasting of rings

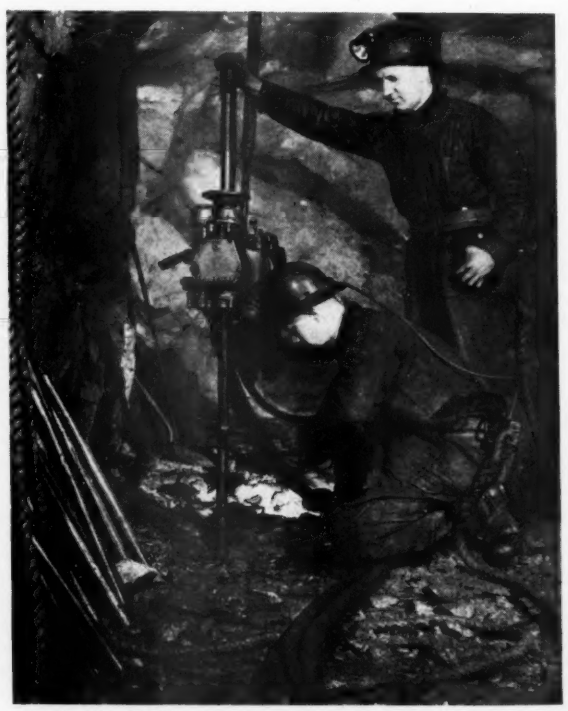
Disadvantages

(1) Poor distribution of ground per foot of drill hole

(2) Alignment of drill holes more difficult



Ring drilling from a drift is safe and convenient.



Blast hole drilling at edge of open stope. Note ropes on safety belts.

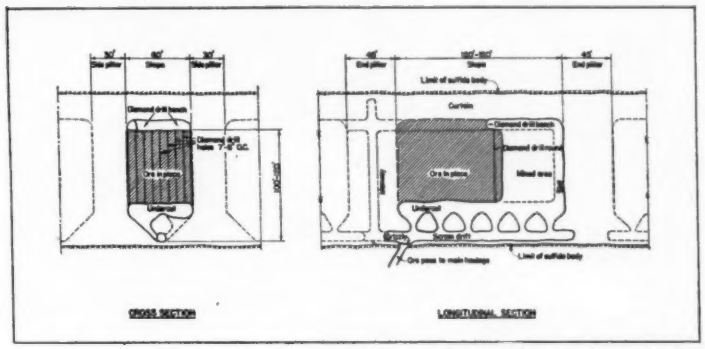
Horizontal Holes

Advantages

(1) Can be used in shrinkage stopes
(2) Can drill out ore body in advance
(3) Gravity helps ore breaking

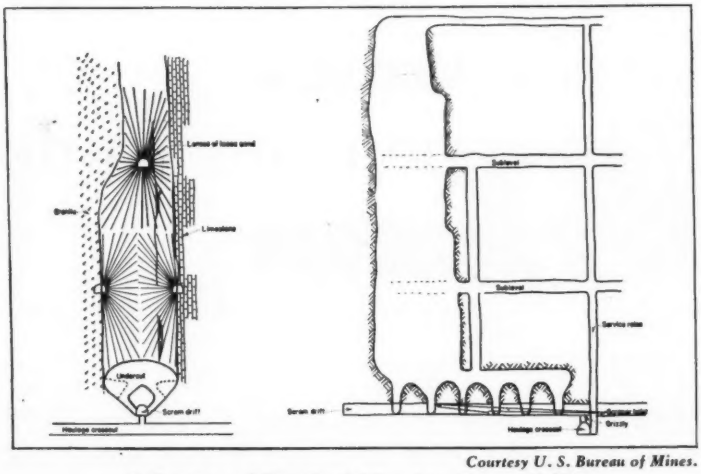
Disadvantages

(1) Set-ups more difficult and may not be easily made safe
Set-ups are often located in a raise above open stope
(2) Surveying and alignment of holes much more difficult
(3) Large back may slab off causing large rocks in the stope to be handled by secondary blasting



Courtesy Mountain Copper Co., Ltd.

Diamond drilling the Richmond orebody, Shasta County, Calif.



Courtesy U. S. Bureau of Mines.

Drill pattern of Pine Creek Mine, Inyo County, Calif.

Diamond Drilling Versus Percussion Drilling

Advantages

(1) Longer holes giving better confinement of powder and better breakage of hole
(2) Tons broken foot of per drill hole is higher
(3) Tons per man shift much higher
(4) Much safer working places for drillers may be easily obtained
(5) More ground can be drilled out ahead of ore breaking
(6) Powder consumption usually less
(7) Greater footage per drill shift

Disadvantages

(1) Fragmentation not as good
(2) Selective mining not easily accomplished
(3) Undue dilution may result in ore bodies with irregular wall
(4) Cannot be adapted to all ore bodies
(5) More engineering required to outline the ore body and lay out the drilling program
(6) Upkeep of diamond drills is higher
(7) More difficult to charge and shoot long holes

Perhaps the most important item governing the success of long hole blasting is determining whether or not the ore body can be effectively extracted by the use of long holes. Another may be the accurate determination of the boundaries of the ore body. Accurate surveying and laying out of the drill hole patterns, along with the accuracy of underground execution of the work planned constitutes a serious problem. Wandering or traveling of the drill holes off their course must be considered as the deflection of the drill hole at the bottom may easily be sufficient to cause boot-legs. Experience has shown that drill holes ranging in length from 50 to 70 ft do not give much trouble.

Diamond drilling of blast holes has proved economical at some properties for breaking of boundary shrink stopes, removing pillars not readily accessible for percussion drilling, and for driving scraper drifts. Several properties utilize long blast holes for part or all of their stoping operations. There is an increasing trend to the greater use of diamond drill long hole blasting methods in stoping because the sum total of the advantages offer safer and more economical production.

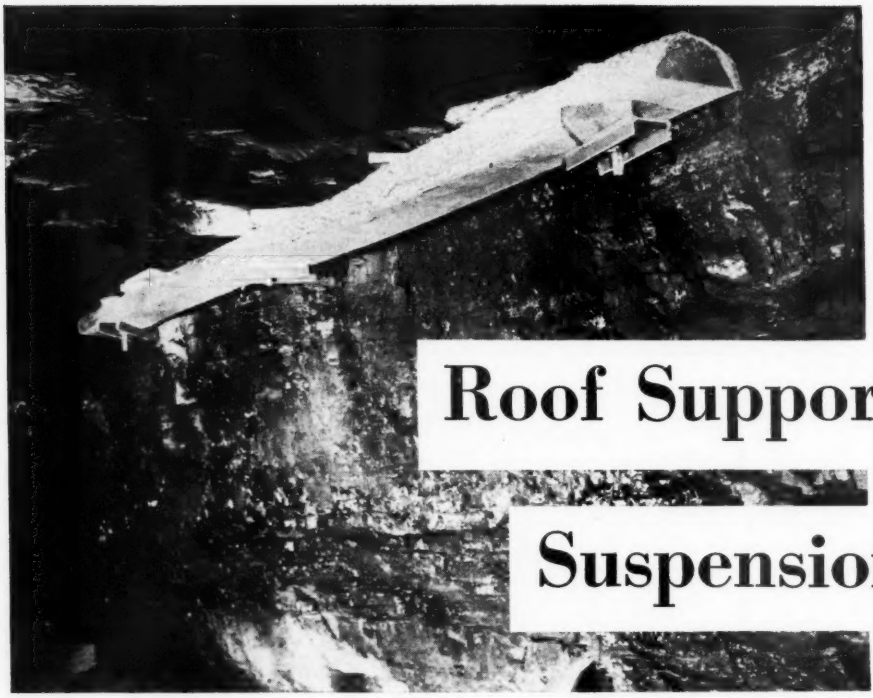
Coal Conservation

(*Continued from page* 28)

Branch has assigned some of the Federal inspectors to conduct classes for mine safety committeemen and other interested persons for the purpose of explaining and discussing the inspection codes and demonstrating mine hazards through visual aids to the end that fatal and nonfatal injuries in coal mines will be reduced. These activities have had definite support of both management and labor, and the classes have been well attended; approximately 2500 mine safety committeemen have completed the course of training and more than 1000 are enrolled in training classes at the present time.

Additional activities are conducted by a small group of selected mining engineers who conduct courses in coal-mine accident prevention for operating officials and others who aspire to become officials. The coal-mine accident-prevention course for officials includes considerably more detail than the course for mine safety committeemen because it covers virtually all accident-prevention aspects for coal-mine operations. It involves discussion of the studies and recommendations of the Bureau throughout its years of experience to the end that coal mines will be safer and healthier places in which to work.

The time for increased interest and practical demonstration of conservation is *now*—in mining methods, utilization and accident prevention. Conserve your assets and you will be well repaid both economically and in the realization that you have accomplished something worth while for yourself, your industry and for the nation.



Bolted crossbar eliminates posts at room neck

Roof Support With Suspension Rods

Coal Mining May, Under Certain Conditions, Effect Increased Safety and Economy in Supporting Bad Top by Utilizing the Roof Bolting Practice Described

By C. C. CONWAY
Chief Engineer
Consolidated Coal Company

NATIONAL Safety Council statistics indicate that coal mining is among the most hazardous occupations and the Bureau of Mines reports that falls of coal and roof are the major causes of accidents. For that reason it seems advisable to discuss a different and possibly advantageous method of supporting roof by suspension rods anchored in a strong strata overlying the draw slate. I say "possibly advantageous" because it may not be so for all roof conditions encountered, although in our case, and under our conditions, we have found that not only is our safety greater, but that we can mine areas which might otherwise be uneconomical.

The U. S. Bureau of Mines will soon publish IC 7471 which treats with roof suspension rods.

Roof Characteristics

The Consolidated Coal Company's Mine No. 7 at Staunton, Ill., in the Central Illinois field, on the Wabash Railroad about 40 miles out of St. Louis, is in the Illinois No. 6 seam. Natural conditions are typical for that section of the state. The coal has about 375 ft of cover with the upper 50 to 150 ft composed of unconsolidated materials which are chiefly clay, gravel, and sand. The remainder of the overburden is shale, sandstone, and limestone, with the exception of several thin seams of coal and the further important exception of a slate, usually referred to as draw slate, which lies immediately above the coal.

Since the limestone over the slate is of exceptionally fine character and of thickness probably never less than 20 ft, our chief concern is with the slate which is a black material ranging from a laminated structure to a more blocky arrangement with cleavages usually horizontal. This physical difference represents different stages of metamorphosis from shale to slate. Although the slate is usually well bedded, steeply pitched point planes are fairly common and the resulting slips are often the source of difficulty in supporting the mine roof. The slate at best has comparatively little structural strength, but conditions are particularly aggravated by pockets of extremely soft material which are locally referred to as "clod." The thickness of the slate varies from a few inches to 7 or 8 ft; when of moderate thickness it does not usually cause much roof difficulty, provided it is of such a nature that it does not fall with the shooting of the coal, but as its thickness increases, the difficulties are many. The labor and timbering involved in holding the slate safely in place is considerable, but the labor involved in cleaning rock from the top of new falls of coal is even greater. A cleaning plant with ample coal washing capacity can handle a certain amount of slate, but not to the

extent of 5 ft of rock with 6½ ft of coal where the refuse would be approximately 62 per cent by weight.

The Theory of Roof Bolting

The bolting procedure, and the reasoning behind it, can probably be best described with the help of diagrams and sketches. Fig. 1 is a longitudinal section of a room with dotted lines to show the advancement of the room cut by cut; that is, by falls of coal. If the room is timbered systematically

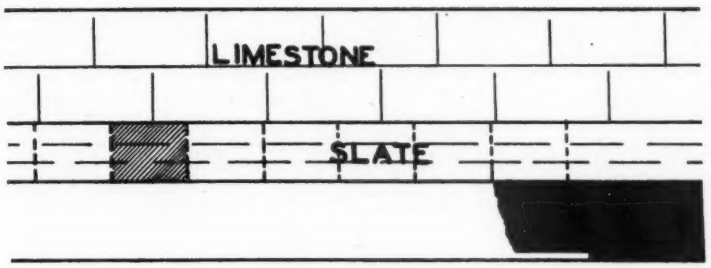


Fig. 1. Longitudinal section of a room.

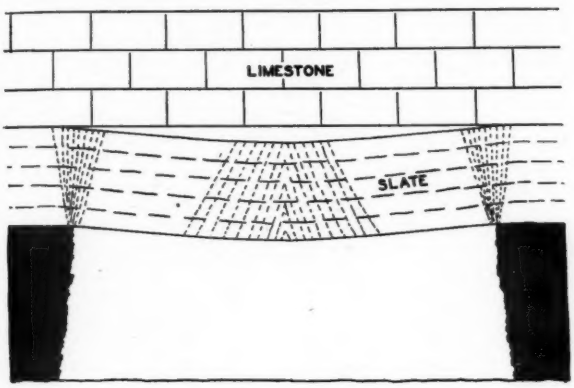


Fig. 2. Cross section of a room with slate unsupported.

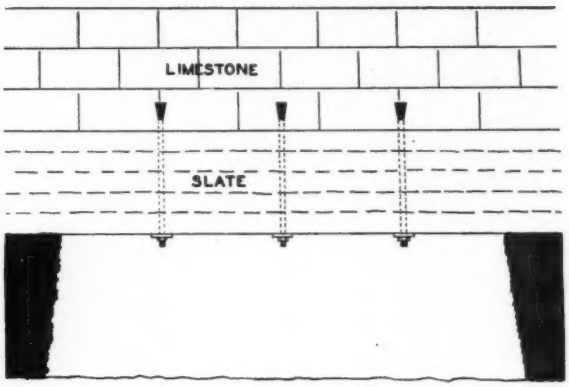


Fig. 3. Room with slate held by rods.

and uniformly after each cut, then any section back from the face—as for example the crosshatched section—is the same as every other section, as far as support is concerned. The crosshatched section, representing an 8 ft length with 5 ft of slate overhead, can obtain no support from adjacent sections because the adjacent sections are similarly supported. The problem then is to hold each section of roof, consisting of slate, 5 ft in thickness, 8 ft long (the depth of the cut), and the width of the room which we will consider in this case to be 24 ft.

Fig. 2 represents a cross section of the 24-ft room and a side view of the 5 by 8 by 24-ft section of slate which must be supported. The slate has been sketched as a beam with fixed ends and with an exaggerated deflection. Such a beam—at 175 lb per cu ft—would have a weight of 7000 lb per foot of lineal length. If this beam were of steel and of the specified loading, the deflection might easily be calculated, but since the slate does not have uniform elasticity, and in fact is not uniform in any manner except possibly in size, it is impossible to predict its behavior. Regardless of whether or not the beam is uniform in its elasticity, and excepting the possible presence of slips, it is quite evident that the stresses will be greatest at the points indicated by dotted lines. If the beam is allowed to deflect any appreciable distance, there will be failures at the ribs and at the center because slate has such poor tensile strength.

The same beam is shown in Fig. 3, with the slate bolted to the overlying strata so that deflection does not occur and consequently there is no failure at ribs or center. If this beam can be supported—as shown in this illustration—we have accomplished the prime purpose of roof bolting, as it is quite obvious that if the slate is held in place by the roof bolts until the face is sufficiently advanced, then conventional timbering is possible, and the beam will have all of its original strength. If the ribs are not broken, then they will carry the major portion of the load and the timbers and roof bolts will be supplementary, whereas, if the ribs are broken, then the entire beam is more or less dead weight on the supports. At this point it might be well to mention that there is no intention to completely eliminate timbering. It is likely that in many cases the amount of timbers will be somewhat reduced, but it seems desirable to maintain a systematic plan of timbering; that is, systematic under any given set of conditions.

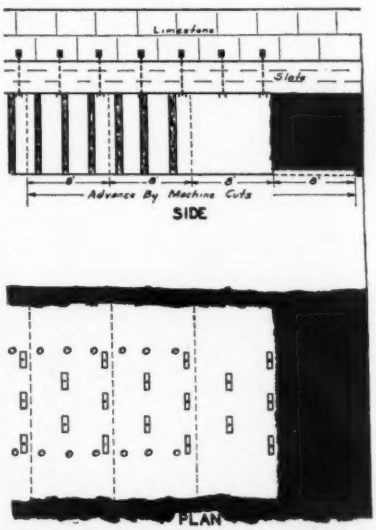


Fig. 4. Plan and section show typical bolt spacing.

Equipment and Bolting Procedure

Fig. 4 illustrates a typical spacing of bolts and props and shows the most important feature of roof bolting—the placement of bolts as near to the face as possible. This should be done before the coal is undercut, as the roof then has its greatest support and the slate immediately adjacent to the face should not be under any abnormal stresses. Although the amount of roof normally unsupported, except by ribs and face, is usually not less than 16 ft, where the advancement is 8 ft per cut, the roof bolts support the roof within 9 ft of the face after the fall of coal is shot. It is this feature that makes it possible to support

the roof until the face has advanced a sufficient distance to set props. The roof bolting at the face also provides greater safety for the face workers.

Essential parts of the bolting equipment are shown in Fig. 5. The expansion shell is similar to that used to support trolley wire, the bolt is 1 in. diam and of such length as may be necessary for the particular thickness of slate encountered. A short section of channel iron is used as a washer, but for extremely poor slate it might be advisable to use a channel spanning two or more suspension bolts. The special nut is used to tighten the rod in the expansion shell and to facilitate the removal of the rod when necessary. It is used only as a tool to aid in placing the roof bolt. A photograph of another type of expansion device is also shown. This last type of bolt is similar to that ordinarily used in the metal mines and is the type used by the St. Joseph Lead Co. in their mines near Bonne Terre, Mo.

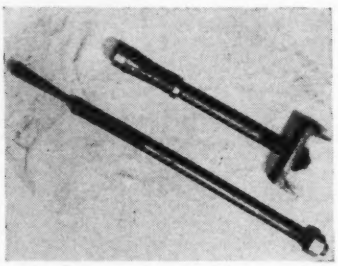


Fig. 5. Two types of anchors used.

The actual operation of placing the roof bolts is shown in Fig. 6. The man on the left is operating a safety stoper, which is used to drill the hole through the slate and 12 to 16 in. into the limestone. This drill differs from the usual design and is called a safety stoper because it is supported on a column consisting of two telescoping tubes which are forced into the bottom and into the roof by air pressure. It is so equipped that in the event of a broken hose or other cause of air failure, it will continue to support itself for at least 30 sec. The stoper is rather long and it is necessary to use 18-in. changes of drill steel but, even so, it is possible to set the machine and drill through 5 ft of slate and 18 in. of limestone in approximately 4 min. After the driller has completed the hole, he places the bolt, complete with expansion shell, into the drilled hole and as the last portion of the hole is the smallest, he sets his expansion shell to such gauge that it is necessary to drive the rod with his air hammer through that portion of the hole. To protect the threads during the driving, he uses the special nut previously mentioned and with the drill socket forcing against the nut, he further extends the expansion shell by using a wrench on the special nut, thereby turning the bolt and pulling the expander deeper into its shell. Then the driller's work—in connection with that particular roof bolt—is finished. While he drills the next hole, his helper, who is shown on the right—places the channel iron and other washers as may be required on the bolt and tightens the nut with the special wrench provided for that purpose. A bolt, complete with expansion shell, is shown leaning against the face and in the right foreground is shown a bolt placed into the roof but without washer or nut.

The truck whose end is seen at the left of Fig. 6 is shown in Fig. 7. This truck was built in our own shops, it is self-propelled by a 5-hp motor, equipped with a 145-cu ft, air-cooled compressor driven by a 40 hp d-c motor, and receives its power by means of a trailing cable. The truck has a bed of sufficient length to carry 8-ft props with little overhang.

Two men with a truck do the bolting operation. These men—their truck loaded with props—step into the cycle immediately behind the loading machine and precede all other face preparation. They bolt the roof where the fall of coal was just loaded out and then place timbers as necessary under the slate of the preceding cut. In the event that a crosscut or room neck is to be cut, they place roof bolts across the proposed opening or place a crossbar in a manner that will be shown in a later picture. The system requires that every face receive equal attention, as a failure to bolt will probably mean that the slate will fall with the shooting of the coal.

Methods and Results of Bolting

Figs. 8 to 15 are photographs of bolted roof, with the exception of Fig. 8 which illustrates the general roof condition and indicates that considerable timber was required to support the 5 ft of slate. Although the slate is supported over the crossbars, it is apparent by the falls between the prop line and the rib that excessive movement occurred with the result that the rib was broken. Fig. 9 also shows 5 ft of slate with a roll in the limestone in the right foreground of the picture. This place, however, has

Fig. 6. Two men drill roof holes and set bolts.

been "caught up" by means of roof bolting and the remainder of the room, to the face, is standing well. The character of the slate is shown well in Fig. 10. This place was also "caught up" by means of roof bolting. Although roof bolts are visible under the crossbars, the three rods that made the catch are immediately behind the foremost crossbar and of course are not visible. A view of the bolting of this particular place is shown in Fig. 11. Note that several of the crossbars in the foreground do not have legs. The ends of the crossbars are bolted directly to the roof, eliminating legs which would otherwise be a handicap to the shuttle car haulage through this crosscut. The crossbar shown in its entirety and without supporting props was placed before the crosscut was undercut or shot.

A shuttle car turnout is shown in Fig. 12. This combination of roof bolting and timbering, with only one leg placed in the entry, allows considerable freedom to turn the shuttle car in any desired direction. A number of roof bolts are shown in this photograph and the structure of the 5 ft of slate is also well indicated. A crossbar placed parallel to the room and in front of a proposed crosscut is shown in Fig. 13. (See opening illustration.) It is interesting to note that the method of placing this crossbar was to support the crossbar on a roof jack and drill the three holes through the crossbar, through the slate and into the limestone. The pneumatic hammer drills a surprisingly smooth hole through oak timber at about the same rate of advance as in limestone.

Fig. 7. Drill truck mounts compressor and carries supplies.

Fig. 8. A typical roof condition to be corrected by bolting.

In the usual manner of timbering directly at the face of rooms three roof bolts are placed immediately adjacent to the face. A typical installation of these bolts is shown in Fig. 14. A washer, consisting of a 2 by 12 by 12-in. oak plate, was used under the channel irons on these particular bolts to obtain some cushioning as well as greater bearing area. Prior to the use of bolts, the slate in this particular room was all down, but it was "caught up" with the first application of roof bolts and held up continuously to the face which is visible in the background. This particular row has 4½ ft of slate.

The practicability of supporting slate from a bed of limestone has been demonstrated in more than a year of experimentation, during which hundreds of suspension rods were placed without a single failure. In every application the slate has been caught with the first round of bolting. It has gained the respect of workmen in the territories where it has been used and where it is indicated that it will be the answer in mining some coals that would otherwise by marginal.

Laminated Shale Made Homogenous by Bolting

Many mines, however, do not have limestone into which expansion bolts may be attached and we have limestone available in only a small percentage of the total workings of all our mines. In Southern Illinois the limestone is not of comparable thickness with Central Illinois and there also exists 25 to 80 ft of shale between the coal and the limestone. Experiments with the bolting of shale roof are just getting under way in our Southern Illinois mines, where the problem of supporting a roof of 20 or 25 ft of shale is of course entirely different than the support of slate to a bed of limestone as just described. If roof bolts are to be used, then the immediate roof shales must be bolted to other shales lying above.

Figs. 9 and 10 above, 11 and 12 below, show combinations of roof bolting and timbering.

The shales of Southern Illinois are usually described as grey, fine-grained, and well-bedded, but due to displacements and other ground movements, slips are quite common. Their number and severity vary widely from mine to mine and often in small areas, so any plan to support shale roof must take these slip planes into consideration and also consider joints vertical to the bed. The frequency of vertical joints varies widely over small areas and the number of joints in one direction may also far outnumber the joints in a direction at right angles. Where fault planes are pronounced, it is often found that places driven perpendicularly to the fault planes, stand better than those driven parallel because of the frequency of the joint planes and their effect on the beam strength of the roof.

The sketches in Fig. 15 are presented in connection with the discussion which is to follow. Again it is appreciated that shale—like slate—does not have a uniform modulus of elasticity and that due to slips and cleavages, it is unpredictable. But there seems to be some merit in considering the problem as a beam requiring support and then to add protection to accommodate for slips. The top sketch represents a number of thin beams of rectangular sections, arranged to form a composite beam supported at each end. The thin beams are intended as an analogy to the laminations of shale. Through a thickness of, for example, 4 ft of shale, there would be hundreds of laminations. Now assuming, which seems logical in most cases, that the shales above the beam are self-supporting, then the only load carried would be the weight of the beam itself. Now if the separate laminations were free to slide on each other—as shown in the sketch—entirely without friction, then each thin beam would deflect a certain amount and every other beam of the same thickness would deflect an equal amount. The deflection would not change, regardless of how many thin beams were used. If, however, this beam is homogenous and of the equivalent depth, then the deflection would be greatly reduced because the strength of rectangular beams of the same width varies as the square of the depth of section. For example, a beam of unit thickness would have a strength of $(1)^2$ or 1, and eight such beams would have a capacity of 8, assuming that the adjacent surfaces were frictionless, whereas a solid beam of 8 units of thickness would have a relative strength of $(8)^2$ or

64. Fortunately the laminations of shale are usually fairly well-bedded and they have considerable resistance to failure in horizontal shear so it would seem that if the roof were bolted as shown in the center illustration of Fig. 15, the effect would be to more nearly approach the condition of a homogeneous or single beam.

The lower sketch in Fig. 15 shows the shale roof supported into a theoretical arch. This is based on the fact that any room or entry will eventually arch itself to full support. Of course if the arching is allowed to proceed over long periods of time, the effects of weathering, swelling, and temperature changes will be pronounced and the arch will be high. If, however, we consider the first falls and neglect the progressive effects, then the arch will usually be within the limits necessary for use as support. Discounting the progressive effects seems logical on the basis of preventing the original fall and thereby eliminating further deterioration.

To demonstrate that the theoretical arch is within range of bolting, the actual dimensions of roof falls in a number of rooms and entries of two mines — rather widely separated — have been plotted as shown in Figs. 16 and 17. The proposed method of bolting these places has been indicated on the sketches, and it will be noted that the theoretical arch is well within reach of the 6-ft rods. The placement of the bolts may be changed after trial, but they have been placed to correspond with the foregoing theories involving both truss action and support from an arch.

Props and other timber are the miners' barometer or measuring stick as they are practically his sole means of judging the condition of his roof. Timbers should not be eliminated and roof bolting should be considered as supplemental support; the chief advantage being that it prevents loss of the roof's original beam strength before adequate timbering is possible.

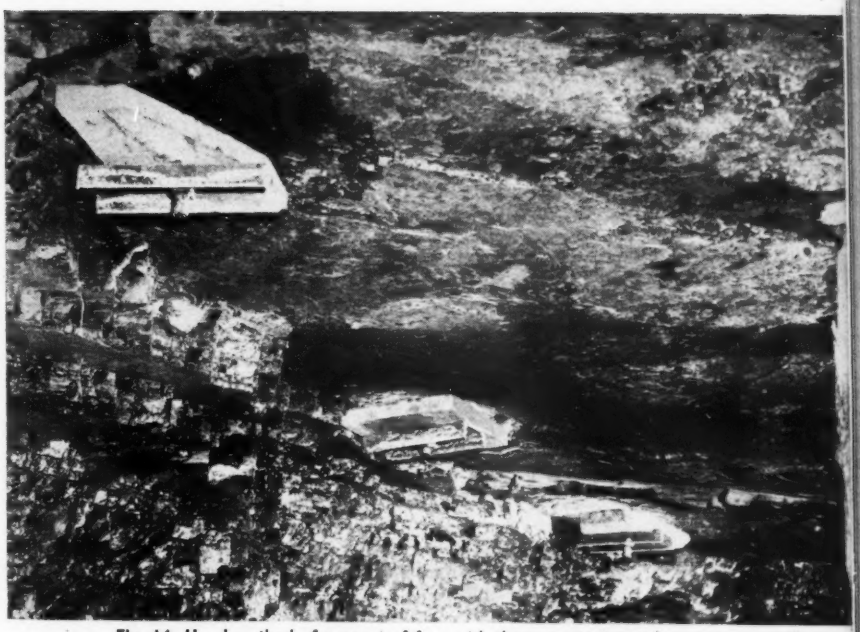


Fig. 14. Usual method of support of face with three suspension rods.

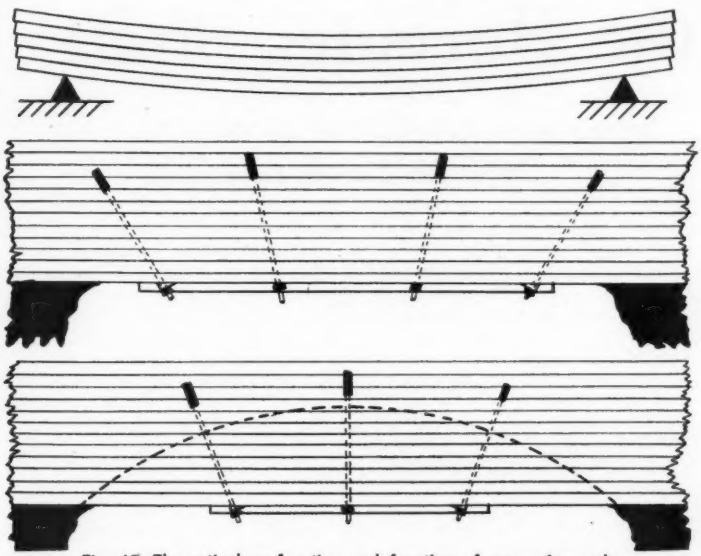


Fig. 15. Theoretical roof action and function of suspension rods.

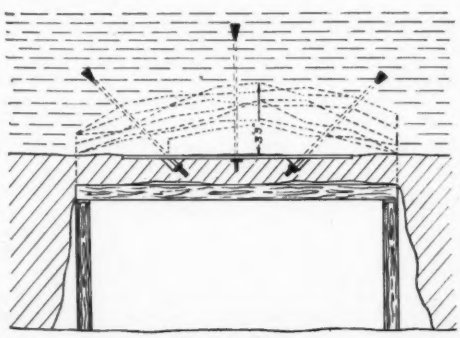


Fig. 16. Entry

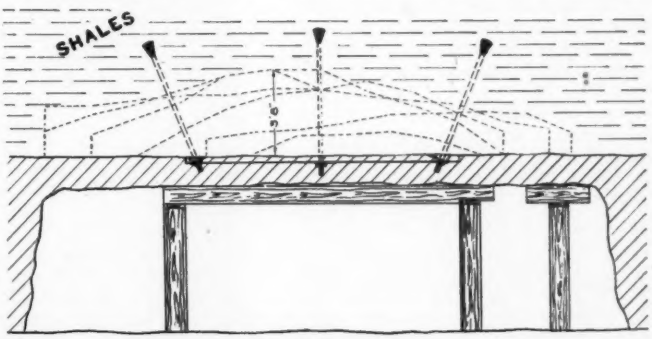
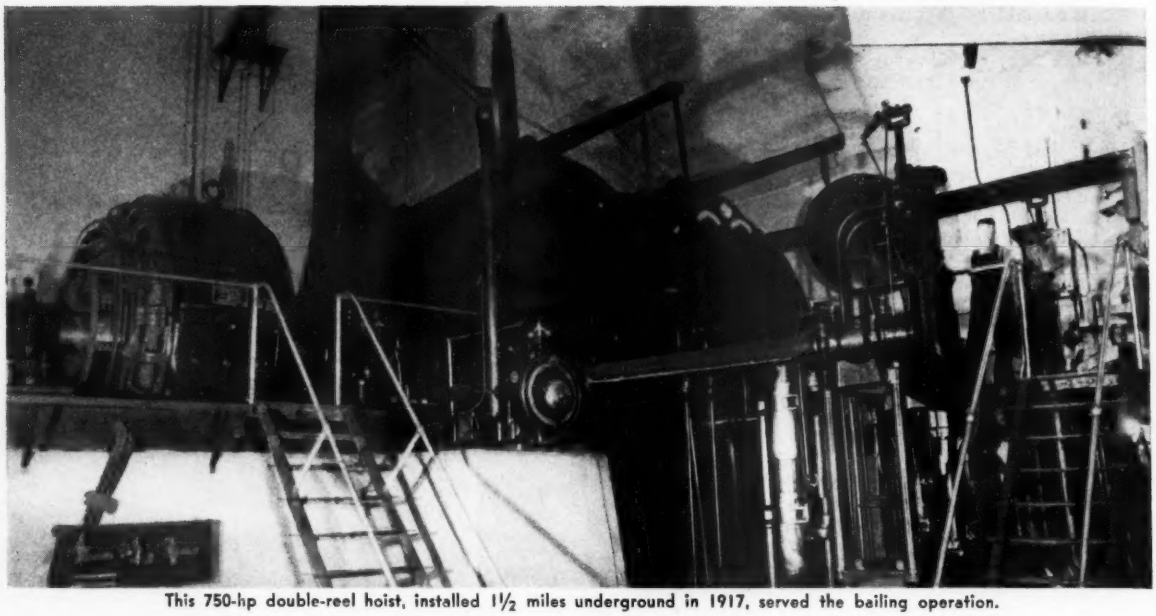


Fig. 17. Room.

Bolting to prevent arching roof falls.



This 750-hp double-reel hoist, installed 1½ miles underground in 1917, served the bailing operation.

Unwatering the Hercules Shaft

Bailing Accomplishes Task in Short Time with Minimum Capital Expense

By HENRY L. DAY

President
Day Mines, Inc.

DURING the summer of 1947, the Board of Directors of the Hercules Mining Co., at Wallace, Idaho, decided to unwater and reexplore the lower portion of the Hercules mine. The Hercules, along with 11 other mining companies, was consolidated into Day Mines, Inc., on October 1, 1947, and the unwatering and rehabilitation carried on since that time by the latter organization. The Hercules property, one of the well-known, early-day producers in the Coeur d'Alene District, was shut down in April 1925, after all known ore had been extracted. The mine was productive from 1902, yielding lead-silver ores and concentrates with a gross value of approximately $80,000,000 and paying dividends in excess of $20,000,000.

The portion of the mine under water, comprising roughly one-third of all the old stoping is situated 1½ miles underground by main haulage adit from the town of Burke, Idaho, at an elevation of 3872 ft. It is reached by a four-compartment shaft. 1280 ft deep, with six levels spaced at 200-ft intervals. No stoping had been done on the bottom level, although the vein was drifted on for more than 800 ft.

The principal factors influencing the decision to unwater the Hercules mine were:

(1) It was possible that tonnages could be found, not previously stopeable, at about half of the assay grade on the former ore production. During the five calendar years, 1920 through 1924, the Hercules mine produced 837,093 dry tons of milling ore, averaging 4.81 oz of silver per ton, 8.37 per cent lead, 1.28 per cent zinc, and 26.36 per cent iron.

(2) In the five post-world War I years, 1920 through 1924, the mine received an average lead price of approximately 7.33¢ per lb. Last summer the 15¢ price of lead made 4 per cent lead concentrating ore attractive for an exploration program.

(3) A concentrator built in 1940 for the Sherman property, near the portal of the Hercules No. 5 adit level, had some capacity available for milling at a cost far less than the old concentrating cost with much improved metallurgical results to be anticipated.

(4) Study of the mineralogy of the ore body below the No. 5 level, indicated that at greater depths than the 1000 level, a favorable change in its character might be possible. The only commercial mineral, galena, was rapidly impoverished below the 600 level, and the deposition on the 1000 level was not commercial. A heavy iron mineralization replaced galena and the quartz-pyrite-siderite gangue found in the upper levels. The iron minerals were of the high-temperature type, including abundant magnetite, relatively plentiful grunerite, with specularite and pyrhhotite generally present. Only siderite remained of the gangue minerals, and was not so abundant at depth. From an economic standpoint it was hoped

that a new succession of galena might be repeated at depths explorable by diamond drilling. Such a favorable change in the mineralization could be due to decreasing temperatures of deposition as the mineralizing solutions cooled off.

Bailing on the scale contemplated is a none-too-common method of unwatering old workings. It was decided to bail out the shaft rather than to use pumps for the following reasons:

(1) Bailing could be started immediately without waiting for delivery of new pumps not obtainable for many months.

(2) The old hoist was available, still mounted on its original foundations. It was in excellent condition and extremely serviceable.

(3) It was believed that the shaft timbers were preserved in good condition, and that bailing could proceed without interruption.

(4) Two adequate bailers could be borrowed from a neighboring mining company.

The hoist itself is of Nordberg manufacture, equipped with Westinghouse motor, motor-generator set, and electric controls. It was originally installed in 1917 about 1.5 miles underground. The hoist room is 40 ft wide, 42 ft long, 24 ft high and is lined with reinforced concrete. Figure 1 is a recent photograph of the unit. The hoist is a first motion, double-reel type, direct connected to a direct current motor rated at 750 hp, 600 v and 60 rpm. The cable is a ½ x 5½-in. flat rope comprised of eleven strands of ½-in. cables sewn together. The hoist has a rope pull of 28,000 lb, with a maximum speed of 2000 fpm. It was designed to hoist the following load from a depth of 3000 ft:

Ore	4	tons net
Skip	2½	tons
Cable	7½	tons
Total	14	tons

The flat rope is reeled upon itself, and at maximum the reel diameter grows from 5 ft to 16 ft. Ward-Leonard controls are used in conjunction with an Ilgner fly wheel on the motor-generator set weighing 18 or 20 tons. The estimated weight of the hoist and accessories, complete, is about 175 tons.

The shaft is vertical and consists of four compartments, each 56 by 62 in. Two of the compartments are used by the main hoist, the third was utilized for the auxiliary hoist, and the fourth is a manway and pipe compartment. Size 12 by 12-in. timbers are used. The shaft traverses excellent ground save for an interval of about 100 ft above the 400 level, where the vein dipping 75 deg south crosses the shaft.

Before bailing could be started the track along about one mile of the No. 5 adit had to be repaired. Two-thirds of the ties had to be changed and the ditch cleaned out for the entire distance. The timbers at the collar of the shaft, and those comprising the top station set had to be replaced, as well as six sets of shaft timbers up to the sheave wheels. The timbers supporting the chute lips of the skip pockets were down and new ones were required. The motor-generator set and hoist motor with controls were rewired and various electrical instruments rehabilitated and reconnected. The hoist itself was thoroughly inspected mechanically and minor repairs and adjustments made.

Bailing Operations

Two bailers were borrowed from the Hecla Mining Co. They had been used to unwater the Hecla mine in 1923 following the disastrous surface fire of that year. The bailers measured 12 ft high by 38 by 48 in., inside dimensions. The volume contained is about 1200 gal; but owing to the leaks and slop-overs, the net load hoisted was figured at 1000 gal per bailer. As shown in the photograph, the bottom is narrowed and pointed so that it breaks the surface of the water readily when dropped into it. When the bailer is pulled up into the dump, 90 ft above the collar, a flapper valve is tripped, allowing the contents to spill out the lower side and down through the old skip pocket. A series of baffles on the main haulage level spread the flow of water rather uniformly to the portal, 8200 ft distant.

Bailing on a three-shift basis was started on October 27, 1947, and took 112 days. The 1000 level was unwatered on February 2, 1948, and the 1200 level 20 days later; a small sinking pump was used from the 1100-ft point on down. It was estimated that about five-eighths of each eight-hour shift was actually spent in hoisting water, the rest in various delays.

The rate of the bailing at the start was slightly in excess of 2000 gpm, and at the finish about 750 gpm. The mine, after unwatering, now makes nearly 200 gpm which is handled by a new pumping unit installed on the 1000 level. This pump is rated at 500 gpm against an 1060 ft head, and is direct connected to a 200 hp, 3450 rpm, 2300-v motor. It is believed that the old level workings and unfilled stopes contained in excess of 100,000,000 gal of water, and that about one-half as much ran in during the period of bailing. In all, it is estimated that 156,600,000 gal of water were hoisted, or about 586,000 tons. The additional water flowing through the adit to the surface flooded the tracks at times but not seriously enough to prevent trolley motor haulage. Several hundred feet of extra flume had to be provided at the portal to dispose of the extra ditch water.

Small Crew

During the unwatering the crew consisted of two shaftsmen, a hoistman, and an oiler on each shift. The former kept the shaft clear of old timbers and made necessary repairs as the shaft became accessible. They also signalled the hoistman regarding the water level in the shaft, furnishing information to enable him to keep the bailers full of water. The hoist-

(*Continued on page* 86)

Two bailers of 1200-gal capacity raised 586,000 tons of water in 112 days.

PLANNING FOR THE FUTURE

Where will the money for new facilities come from?

★

In achieving the record-breaking production of 620 million tons in 1947, the bituminous coal industry spent more than half a billion dollars for operating supplies, repair parts, replacements and new equipment.

This was almost double the amount expended for the same purposes in 1945.

Operating supplies and repair parts alone are estimated to have cost 56 cents for every ton of coal mined in 1947. In the prewar years the cost was around 25 cents per ton.

In addition, the money spent in 1947 for new equipment for replacement and modernization in present mines amounted to 27 cents a ton.

These costs do not include the money for necessary new facilities that bituminous coal producers spent in 1947 or that they will be required to spend this year and in the years just ahead.

In the next three years, it is estimated that another half-billion dollars will need to be invested in new machines and new facilities. Largely, this will have to be plowed back into the business out of profits. The mines must earn the hundreds of millions needed to further mechanize and expand present operations . . . to develop new workings . . . to build new preparation plants . . . to modernize and expand docks and other shipping facilities and to provide countless items of costly new equipment required for the job that has to be done.

And that job cannot be measured strictly by today's conditions. For already in sight are immeasurable new uses and new demands for coal.

But with men and management working together at the mines . . . with our entire industry striding forward in cooperation . . . America can depend on coal.

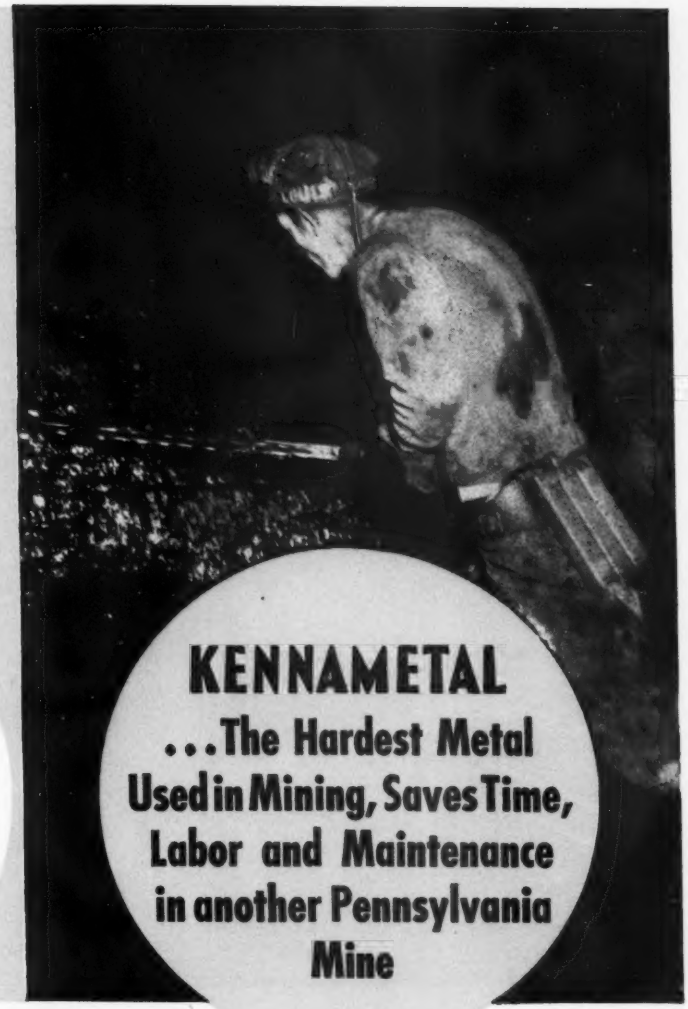
BITUMINOUS COAL INSTITUTE

A Department of NATIONAL COAL ASSOCIATION
Washington, D. C.

Bituminous Coal . . . Lights the Way . . . Fuels the Fires . . . Powers the Progress of America

Still Sharp *After Drilling*

½ MILE OF COAL and SLATE



KENNAMETAL
...The Hardest Metal Used in Mining, Saves Time, Labor and Maintenance in another Pennsylvania Mine

"ONE Kennametal Bit drilled 300 nine-foot holes before it needed to be sharpened," reports a Western Pennsylvania coal mine. "It took 300 steel bits to drill the same footage, under the same conditions. The Kennametal Bit drilled 36% faster than steel bits—three to four places more can be drilled per shift."

Here are other examples of footage drilled by one Kennametal Bit:

—No. 2 Gas Seam, W. Va.—41,000 feet of coal and slate.
—No. 9 Seam, Kentucky—24,000 feet of coal and rock.
—No. 10 and No. 11 Seams, Kentucky—6,000 feet, hard drilling.
—Pittsburgh Seam, Pa.—54,000 feet of coal.

The cost of Kennametal Bits, on the basis of footage drilled, averages from 40 to 70 percent lower than the cost of steel bits, as taken from actual service results. This does not take into consideration savings in time, labor, and maintenance effected through their use. Write, asking us to demonstrate.

Mining Division, Kennametal Inc., Latrobe, Pa.

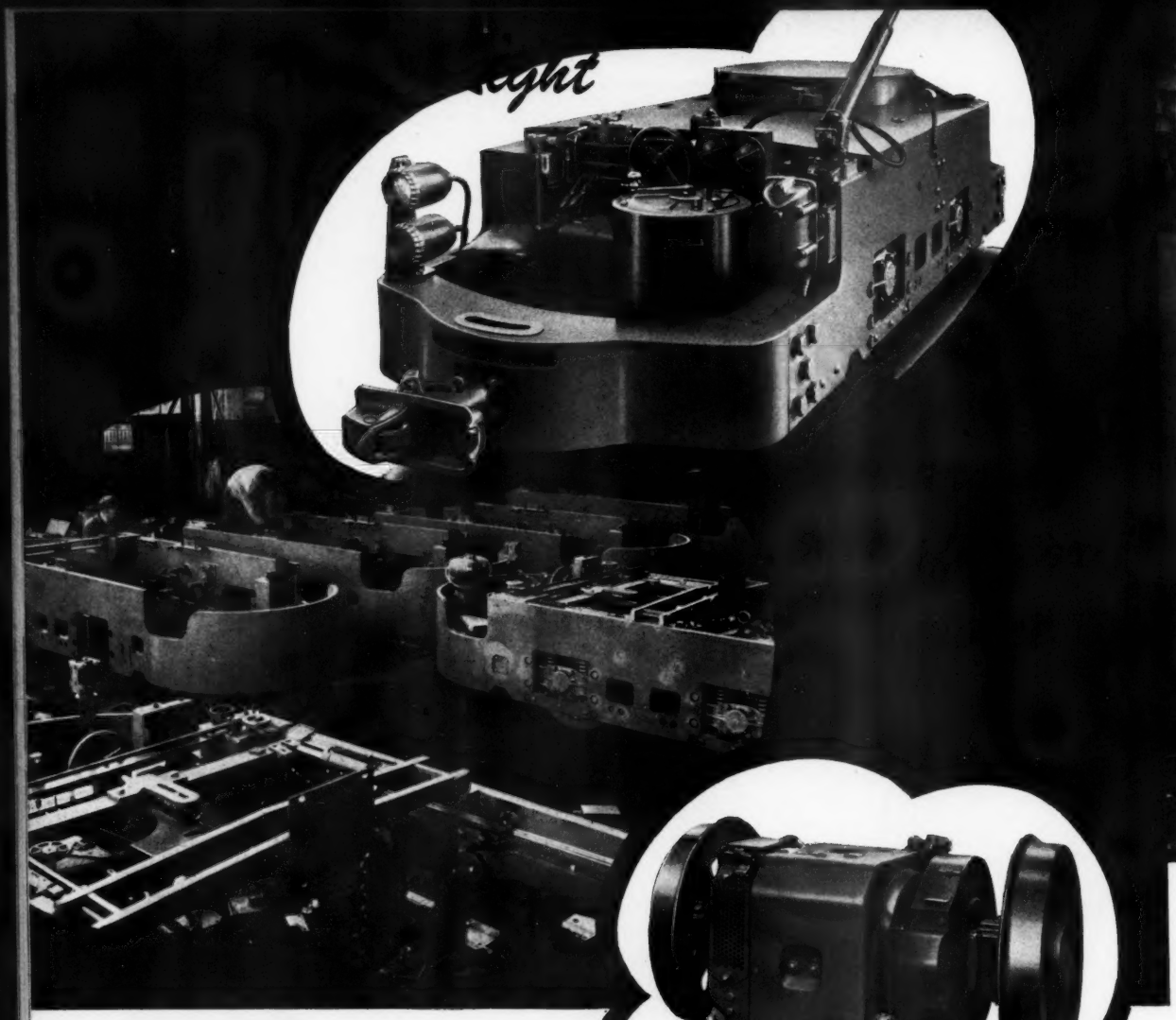
Kennametal Bits withstand shock and abrasion far longer than steel bits because their properly designed cutting edges are solid Kennametal—the long-lived, strong tool material that is much harder than the hardest tool steel.

They drill freely through medium hard materials such as slate and shale, as well as coal. Because they stay sharp and drill single-gage holes, there's less load and less wear on the drilling machine; less labor for the drilling crew.

Drilling speed is increased from 20% to 70%; power consumption is cut from 20% to 40%. And, sharpening expense is only a fraction of what it is for steel bits.

KENNAMETAL

WORLD'S LARGEST MANUFACTURER OF CEMENTED CARBIDE MINING TOOLS



JEFFREY
GATHERING LOCOMOTIVES

Equipment as vital to coal production as locomotives must be of rugged construction to keep coal moving from face to tipple. There is neither time nor space to pamper temperamental equipment below ground.

More than 60 years experience in designing, developing and building locomotives for mine service has taught Jeffrey the importance of sturdy construction. This is clearly indicated in the accompanying photos. Note the frame construction particularly. Another photo shows a motor and wheel assembly. Various types and sizes of motors are used depending upon operating conditions at the mine. Journals may be either bronze bearing or antifriction according to operation needs.

Consult Jeffrey on your locomotives requirements both for gathering or mainline haulage. Jeffrey has the engineering background, the plant facilities and the experience to help select the best unit for your needs. Write for Catalog No. 790 for complete details.

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DRILLS CUTTERS LOADERS FANS UNDERGROUND CONVEYORS JIGS

men who know the ropes...

EXCELLAY PREFORMED

take *Tiger Brand* every time!

● Yes, the Big Demand is for TIGER BRAND . . . because U·S·S American TIGER BRAND is famous for its smooth, trouble-free performance and long, low-cost service life!

Made of uniformly high quality steel wire to close tolerances, TIGER BRAND gives you strength, toughness and flexibility . . . *in the right combination* . . . to stand up tirelessly under the most difficult working conditions. You'll find this more supple rope easier and safer to handle, too. It has less tendency to kink and snarl . . . advantages which save time, trouble, and money any way you figure them!

Your wire rope supplier can give you immediate delivery on any amount of TIGER BRAND you need. Anticipate your requirements. Keep plenty on hand. Don't get caught with your lines down!

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UNITED STATES STEEL

THE BIG DEMAND IS FOR TIGER BRAND

UNION PACIFIC

The Governor of California *invites You*

State of California
GOVERNOR'S OFFICE
SACRAMENTO

EARL WARREN
GOVERNOR

To American Industry:

In California we are currently celebrating the centennial anniversaries of the beginnings of our State. We gain much inspiration from our review of the progress which has been made in the comparatively short span of one hundred years.

During the past eight and one-half years alone California's population has increased by 47 per cent and our industry and agriculture have risen to positions of great importance in the economic life of the nation.

Our tremendous reserves of natural resources and our strategic world trade position on the shores of the Pacific Basin assure California's continued progress in the years to come.

I am happy, therefore, to join in inviting you to investigate the opportunities for expansion which exist in the many communities of our State.

Sincerely,

Governor

Earl Warren

* One of a series of advertisements based on industrial opportunities in the states served by Union Pacific Railroad.

Unite with Union Pacific in selecting sites and seeking new markets in California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, Oregon, Utah, Washington, Wyoming.

***Address Industrial Department, Union Pacific Railroad**
Omaha 2, Nebraska

UNION PACIFIC RAILROAD

Road of the Daily Streamliners

Producing Battery-Grade Manganese-Dioxide

By A. V. TAYLOR, JR.
The Taylor-Knapp Company

Often obscured by the importance of other strategic minerals, battery-grade manganese dioxide is produced domestically to satisfy about 20 per cent of the demand. As we aim at greater self-sufficiency, the technology of strategic minerals increases in importance. The manner in which one of the principal suppliers of this mineral in the United States treats these scarce ores is of considerable interest.

FOR over 25 years, Philipsburg, Mont., has been the principal source in the United States of manganese dioxide for use in dry cell batteries. At present, two companies, the Taylor-Knapp Co. and the Trout Mining Division of the American Machine and Metals Co., are producing battery-grade concentrates. The Taylor-Knapp Co. is successor to the Moorlight Mining Co.

The manganese-dioxide ore at Philipsburg is a mixture of psilomelane, cryptomelane, and pryrolusite with minor amounts of other manganese oxides and occurs in massive cavernous deposits in limestone adjacent to east-west fissure veins and a north-south granite contact. The ores are usually rather soft and earthy, although when admixed with quartz within the veins they may become moderately hard.

As the milling practice is somewhat different in the two mills in the district, the practices described will be confined to those of the Taylor-Knapp Co.

Milling at present is done in two units, an upper mill and a lower mill which represent a single continuous operation. The upper mill was built as a tailings retreatment plant and the lower mill is an ore concentrator built by the Trout Mining Co. in 1925 and acquired by the Moorlight Mining Co. in 1938.

During the 1920's, when the grade of raw ore in Philipsburg averaged from 50-60 per cent MnO_2, the concentrating process was simple. Crude ore was dumped into a bin, crushed to 1 in., dried in a rotary dryer, then screened through a 10-mesh screen, the oversize going to rolls in closed circuit with a second screen of about 20-mesh. The products went to undersize and oversize bins from which fine and coarse material went to magnetic separation for final concentration.

As the grade of ore steadily decreased, it became more difficult to maintain the necessary concentrate grade by simple magnetic separation. About 1941 it became necessary to eliminate some of the gangue contained in the 30-40 per cent MnO_2 ore by gravity concentration before sending it to magnetic separation.

Resulting modifications developed the present flowsheet as follows: The ore is delivered by truck to the upper mill where it is weighed and dumped into a 75-ton coarse ore bin. From this bin the ore is crushed to 1½ in. size by a jaw crusher and then conveyed directly to a 3 by 6-ft Marcy rod mill. As the ore is soft, an intermediate crusher was found to be unnecessary and was removed.

The rod mill is in closed circuit with a 27-in. by 15-ft rake classifier, from which the overflow passes consecutively to 6-ft and 8-ft desliming cones. The overflow from the 6-ft cone and underflow from the 8-ft cone are treated on two Deister slime tables from which approximately one to two tons of final concentrates are made per 24 hours, the tailings from these tables being wasted. The overflow from the 8-ft cone is returned water to the circuit. The sand from the 6-ft cone spigot, if the ore is 40 per cent MnO_2 or above, goes directly to an Esperanza-type drag dewaterer and the drag discharge is dumped on a draining floor while the drag over-

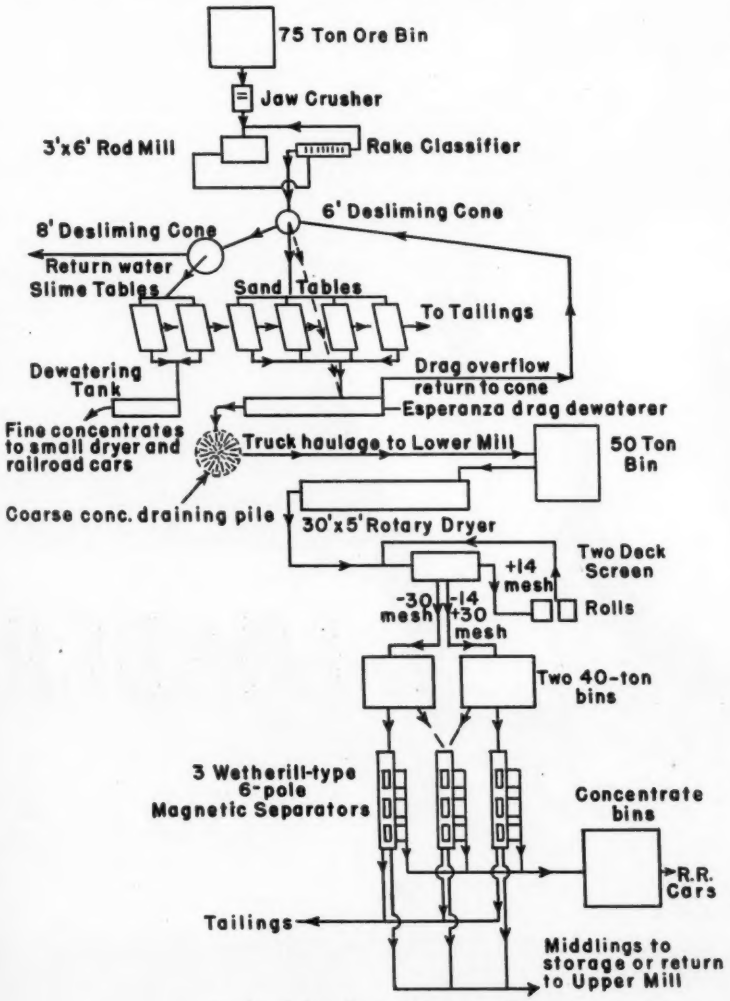
Lower mill magnetically upgrades upper mill concentrate to meet battery grade specifications.

flow is returned to the 6-ft desliming cone.

If the ore is under approximately 40 per cent MnO_2, the sand from the 6-ft cone spigot is passed over four Deister sand tables, the concentrates and middlings going to the Esperanza drag and the tailings to waste. The final sand concentrate from the drags at this plant contains about 24 per cent moisture and assays about 45 per cent MnO_2. Draining reduces the moisture to about 17 per cent before these upper mill concentrates are trucked to the lower mill.

At the lower mill, the upper mill concentrates are dumped into a 50-ton bin from which they are fed by belt conveyor directly into a 30-ft by 5-ft, coal-burning, stoker-fired, Ruggles-Coles dryer. This dryer reduces the moisture to 1½ per cent and the discharge is elevated to a double-deck screen of 14 and 30 mesh size. The plus 14-mesh product is passed through rolls in closed circuit with the screen. The minus-14, plus-30-mesh product goes to the coarse separator feed bin while the minus-30-mesh product passes to the fine separator feed bin.

Upper mill produces gravity concentrate assaying about 45 percent MnO_2.



Combined flow sheet of the two mills.

Magnetic Separation

Three Wetherill-type Dings magnetic separators comprise the magnetic separation unit. One separator treats the plus-30-mesh fraction; another the minus-30-mesh product; while the third is used for the excess of either—usually the fines. Each separator has six poles with two each of 40,000, 60,000, and 100,000 ampere turns. The ore is carried through each separator on an 18-in. main conveyor feed belt under the six successive poles where thin one-ply, 3-in. rubber cross-belts passing under the magnets and over the feed belt carry off the manganese-dioxide particles into pipes discharging into concentrate and middling bins. Concentrates are loaded into paper-lined boxcars for shipment and middlings are stored or retreated at the upper mill, depending on the grade which varies from 40 per cent to 60 per cent MnO_2.

The unsensitive waste material which discharges to tailings from the main feed belt contains from 5 per cent to 12 per cent MnO_2.

One major and nine minor rheostats control the magnetic intensity, the voltage varying from 90 to 120 and with from 6 to 24 amp at 120 v. With different grades and character of ores, the magnetic poles can be raised and lowered or the voltage regulated to make the final concentrate grade. As manganese-dioxide minerals have a magnetic attractability of 0.71 and below compared with iron as 100.00, pole and voltage adjustments can only control the grade within somewhat narrow limits.

Battery-grade Concentrate Specifications

The specifications for battery-grade MnO_2 ores or concentrates are rigid and must be kept within the following limits:

(*Continued on page* 52)

JOY LOADERS

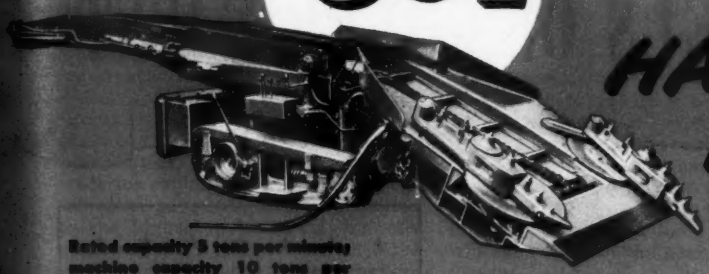
SEND RECORDS SOARING...

REDUCE COSTS...
INCREASE TONNAGE...
OPERATE ECONOMICALLY...
HAVE LOW MAINTENANCE...

Consult a Joy Engineer

JOY 11-BU LOADER

HANDLES UP TO 10 TONS PER MINUTE IN HIGH SEAMS



Rated capacity 5 tons per minute; machine capacity 10 tons per minute. Sturdily constructed for heavy duty work in seams averaging 60" or more in thickness.

JOY 14-BU LOADER

LOADS AS HIGH AS 8 TONS PER MINUTE IN LOW SEAMS

Rated capacity 5 tons per minute; machine capacity 8 tons per minute. Available in 30½", 33" or 36" heights. Individual motors drive gathering arms.

JOY 12-BU LOADER

IS IDEAL FOR CONVEYOR MINING

Primarily a thin seam loader, the 12-Bu is rated at 1 ton per minute with a machine capacity of 1½ ton per minute. Height 28".

WDD CL 12

JOY DIVISION

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As Viewed by A. W. DICKINSON of the American Mining Congress

BOTH Senate and House have now swung into long daily sessions in a definite drive for adjournment by June 19. Slated for enactment are reciprocal trade extension, housing, a draft bill, funds for the European Relief Program and the departmental appropriation bills. Enactment of most other pending legislation is uncertain.

There has been an upset in the legislative course of the tax revision bill to change various administrative provisions of the present law. Ways and Means Committee Chairman Knutson had announced that the bill would be reported May 27 and might possibly be passed by the House on May 28. On May 27 a letter from the Undersecretary of the Treasury to Knutson repudiated a number of the amendments in which the Treasury was understood to have joined. As a result Committee consideration has been delayed and a number of observers feel that there can now be no enactment in this session.

The amendments included a five-year carry-forward and one-year carry-back period for corporation losses, in place of the present two-year carry-back and two-year carry-forward. There are also a number of amendments which affect estates and trusts, annuity payments, life insurance taxes, and family partnerships.

One feature of value to mining included in the amendments deals with the treatment of percentage depletion in computing the net operating loss deduction. The present rules for computing the amount of a net operating loss deduction under Sec. 122 deny any deduction for percentage depletion for the year of loss and for the income year to which the loss might be carried back or carried over. This has been a particular hardship to gold mines shut down by Government order—L-208—during the war and then through this formula denied deductions for their losses from the taxable income of other years. The amendment in the pending bill would eliminate the old adjustment of Section 122 (d) with respect to taxable years after December 31, 1948.

Another amendment to Sec. 102, which deals with surtax on corporations improperly accumulating surplus, shifts the burden of proof from the taxpayer to the Commissioner in cases before the Tax Court where it is alleged that surplus was accumulated beyond the reasonable needs of the business.

The renegotiation of contracts, which had lapsed when the wartime powers expired, was restored in the big Airforce appropriation bill recently enacted. The sponsors of the renegotiation section had omitted the exemption for producers of raw materials which was contained in the Renegotiation Act of February 25, 1944, as amended. At a late hour in the consideration of the Airforce bill, through the efforts of the American Mining Congress, the exemption was restored, excluding "any contract or subcontract for the product of a mine, oil or gas well, or other mineral or natural deposit, or timber, which has not been processed, refined, or treated beyond the first form or state suitable for industrial use." This is identical with the mineral raw material exemption in wartime renegotiation statutes, which avoided extreme difficulties and uncertainties for producers of coal, metals, and minerals, whose product was sold in large part on government contracts or subcontracts. The exemption was likewise of great value to manufacturers of mining equipment, whose sales to the mines were thus made non-renegotiable.

Foreign Trade Agreements

Passed by a House vote of 234 to 149, the bill extending the Reciprocal Trade Agreements Act until June 30, 1949, is now before the Senate Committee on Finance. Under the bill the President, before entering trade negotiations, must furnish the Tariff Commission a list of articles to be considered for the granting of concessions. Investigations and hearings by the Tariff Commission are required and the Commission will thereafter recommend to the President limits for the raising or lowering of tariff rates. If such limits are exceeded in the negotiation of a foreign trade agreement, the President must submit such changes to Congress together with his justification for going beyond the limits. If Congress within 60 days disapproves the rates which exceed the Tariff Commission's recommendations such rates must be renegotiated. It is also provided that the President may not lower any rates by more than 50 per cent from rates in effect January 1, 1945, nor increase by more than 50 per cent rates in effect June 12, 1934, nor transfer any article between the dutiable and free list.

Incentive Payments

On May 26 the House Public Lands Committee reported a revised Russell (Rep., Nev.) bill, H. R. 6623, replacing the original H. R. 2455. The measure is now awaiting the action of the House Committee on Rules.

The new bill creates a "Mine Incentive Payments Division" in the Department of Interior and establishes "conservation" payments for ores,

★ ★ ★ ★ ★ ★ ★ Washington Highlights

CONGRESS: Driving to adjourn.
TRADE AGREEMENTS: House extends for one year.
INCENTIVES: New Russell bill reported.
MINERALS HEARINGS: More production sought.
GOLD: Free market?
"LEASERS": Gearhart bill advances.
LABOR HEARINGS: Ball Committee in action.
MINERAL LEASES: Larger acreage.
COAL: Bituminous wage conference suspends.

★ ★ ★ ★ ★ ★ ★

metals and minerals included in group A of the current Munitions Board list of strategic and critical minerals. An exception is made for minerals found by the Board no longer necessary for stockpile purposes. Payments are provided "at such rates . . . as to encourage development, production, and conservation and make adequate allowances for depreciation, amortization and depletion," with a reasonable profit to the producer. In addition to conservation payments, provision is made for exploration payments. Conservation payments would be limited to the highest prices paid domestic producers from 1942 to 1946, adjusted in proportion to subsequent changes in the Bureau of Labor Statistics wholesale price index of all commodities but the Director of the Division could exceed this for particular metals or minerals. The RFC would purchase additional production resulting from incentive payments for the defense stockpile. All disbursements for exploration and development and conservation payments could not exceed $80 million in any one year.

A similar bill was introduced May 26 under the number S. 2755 by Senators Malone (Rep., Nev.), Butler (Rep., Nebr.), Wiley (Rep., Wis.), Ecton (Rep., Mont.), Cain (Rep., Wash.), Watkins (Rep., Utah), Thomas (Dem., Utah), Hatch (Dem., N. M.), McFarland, (Dem., Ariz.) and Chavez (Dem., N. M.). This bill, however, provides a definite schedule for the exploration payments, as presented by a group of Rocky Mountain metal and mineral producers in a draft submitted by mining men to the Department of Interior several weeks ago.

Minerals Resources Hearings

Hearings discussed in last month's issue continued before the Lemke Mines and Mining subcommittee of the House Public Lands Committee. Arthur M. Hill, Chairman of the National Security Resources Board, testified concerning mineral resources on May 6. He discussed Government efforts to acquire a stockpile of strategic and critical materials but stated that his Board has not been requested by the Munitions Board to develop a stockpile purchase policy. Hill said that contracts for the national stockpile are not expected to exceed $660 million annually for the next four years and that commitments this year will probably not exceed $375 million. He did not endorse incentive payment legislation although the Committee endeavored to get him to do so.

Testifying before the subcommittee on May 24, S. H. Williston, vice president, Cordero Mining Co., set forth the present position of the quicksilver and tungsten industries. Explaining that the European quicksilver cartel dumped quicksilver on the U. S. market after the war, thereby cutting domestic prices, he referred particularly to the recent price increase made by the cartel for the U. S. market in which it was announced that, "the advance is attributed to the elimination of the greater part of U. S. domestic production owing mainly to these cheaper (cartel) offers." The witness told the subcommittee that the number of our domestic quicksilver mines has decreased from 197 during the war to 2 at the present time and that one of these two mines will shut down in the near future.

Williston also emphasized that the domestic tungsten industry is facing destruction due to the reduction in the tariff brought about by the foreign trade agreement negotiated at Geneva.

Free Market—Gold

Asserting that reestablishment of the stability of European currencies will require the largest possible supply of gold, Senator Pat McCarran (Dem., Nev.) has introduced a bill to establish a free market for gold either mined in this country or imported. The bill would also allow free and unrestricted export of gold. A similar measure was introduced by Rep. Clair Engle (Dem., Calif.).

The Nevada Senator emphasized that his bill would implement the President's anti-inflation program and stated that a free gold market "would not change the obligation of the Treasury to buy all gold offered at $35 an ounce, nor would it require the United States to sell any gold at all, or to redeem any currency in gold. The Treasury could still retain $23 billion in monetary gold without any obligation to sell any of it or to redeem any currency with it, and the Treasury would be freed of all the necessity of buying any new gold at a price above $35 an ounce. It would not affect in any way the management of the public debt; it would not require the purchase of outstanding bonds, affect the interest rate or the price of bonds." McCarran declared that his bill would accomplish the same results that the Reserve Board hoped for by instituting an elaborate system of controls over the banking and monetary systems.

In introducing his companion bill, Rep. Engle said it would end the inflationary effect of all gold going into the U. S. Treasury as it does now; stabilize the position of the American dollar by showing its true relationship to an ounce of gold in a free market; give the people of America an historically reliable repository of value for their savings in these times of inflation and threatened deflation; and give the gold producers the benefit of a higher price for their product in a free market, and thus, by increasing total gold production, increase the national wealth.

Engle supported the policy urged by Francis H. Brownell of the American Smelting & Refining Co. and Donald H. McLaughlin of the Homestake Mining Co., by declaring it is time "for the American Government to get back to a sound currency. The only way that can be done is to give the American people a chance to reflect the true position of the American dollar in terms of an ounce of gold."

Independent Contractors

Now subject to Senate floor action is the Gearhart bill, H. J. Res. 296, which would prevent the Treasury from extending the Social Security payroll tax to apply to independent contractors such as mine "leasers." This measure, discussed in the May JOURNAL, was reported by the Senate Committee on Finance on May 6.

Meanwhile, the White House has recommended in a special message to Congress a broadening of the Social Security coverage to include groups now excluded, to increase from $3,000 to $4,800 the limit on earnings subject to tax, and to raise the payroll tax from 1 per cent to 1½ per cent upon employers and employes, effective January 1, 1949 instead of January 1, 1950.

Taft-Hartley Act Hearings

On May 24, Senator Ball's (Rep., Minn.) Senate-House Taft-Hartley Act "Watchdog" Committee opened hearings on "proposed specific amendments" to the law "and on problems which have arisen under it."

Questions posed by the Chairman on which he asks that testimony be presented include dropping of the election requirements for the union shop; speeding of decisions on representation and unfair practice cases; additional enforcement of the right of free speech and the non-Communist registration requirement; control of industry-wide bargaining and industry-wide strikes; solution to the union welfare fund problem; and stronger penalties for unions striking to force an employer to violate the Act.

Information assembled by the Committee during the hearings will be used in preparation of the report which is to be made to the Congress early in 1949. It is expected that the hearings will be recessed from mid-June to mid-September at which time there may be increased realization of the need for further legislative action.

Mineral Lease Areas

Now on the President's desk following Congressional approval is the Hatch (Dem., N. M.) bill, S. 1006, which increases maximum areas which may be held under lease for the mining of a number of minerals on the public domain. As the bill passed the Senate last summer, it carried an increase in sodium lease areas in any one State from 2,560 acres to 15,360 acres. In the House Committee on Public Lands, amendments were added increasing areas for phosphate or coal leases in any one State from 2,560 to 5,120 acres, and for phosphate leases in more than one State to 10,240 acres. The Secretary of Interior was authorized to reduce or suspend coal, oil, gas, oil shale, phosphate, sodium, potassium and sulphur rentals or minimum royalties when necessary in his judgment to promote development or successful operations. Potash leases are granted an indeterminate term, running for 20 years and as long thereafter as mining is continued, subject to readjustment of terms and conditions every 20 years.

In view of the difficulties of financing mining operations this bill is a real step forward in providing proper assurance of sufficient minable areas and of the prospect of continuity of lessee rights.

Coal Industry Problems

Contract negotiations between the United Mine Workers of America and the Anthracite Operators Committee began May 20 for the purpose, as stated by the UMWA, of negotiating new arrangements affecting wages, hours, rules, practices, differentials, inequalities, compensation and occupational disease laws, welfare, health, safety and all other pertinent matters appertaining to the anthracite industry.

The bituminous coal mine joint wage negotiations conference began May 18 but stopped abruptly on May 19 when the mine workers walked out over a controversy involving representation of the Southern coal producers. On May 20 the bituminous operators, including the Southern producers, called upon the mine workers to resume negotiations; to date mine workers' officials have not replied.

When the bituminous joint wage conference convened May 18 the operators named as one of their representatives Joseph E. Moody, President of the Southern Coal Producers Association. The mine workers objected to Moody, charging that the Southern Coal Producers Association was a "holding company" and not a valid bargaining agent for the southern group. Speaking for the operators, Hubert E. Howard of Illinois insisted that Moody was properly accredited to represent the Southern operators, and that it would not be within the province of the mine workers to choose the bargaining representative for the operators. UMW John Lewis then stated that if Moody were seated "there will be no conference." Lewis took the position that the Southern Association was not a signatory to the 1947 agreement and that the Southern signatories were obligated by the terms of that agreement to be represented by an agent, but that that agent could not be the Southern Association. A vote was taken on the seating of Moody and the mine workers walked out following Lewis' statement that "I make the observation that there is now no conference."

The Southern Coal Producers Association promptly filed complaints with the National Labor Relations Board in which the UMWA was charged with refusal to bargain. The complaint petition stated in part: "The urgency of this situation is manifest. The Union's refusal to comply with the requirements of the Labor-Management Relations Act endangers the present negotiations for a new contract upon the expiration of the present Bituminous Coal Agreement on June 30. Only the prompt and effective intervention of your office can secure the Southern Coal Producers Association its rights under the Act . . . It is our belief that unless the procedures contemplated by the Act are invoked there can be no effective remedy in the present situation. We urge that such procedures be adopted and that an Order of the Board be secured which will enable the Southern Coal Producers Association to function in future as the statutory bargaining agent for its members and those who may authorize it to represent them for purposes of collective bargaining."

Meanwhile, on May 18 the Government asked Judge Goldsborough, who has twice fined Lewis and the UMWA for contempt, to drop the civil contempt charge against Lewis and the mine workers and withdraw the 80-day injunction against the strike. Stating that the civil contempt conviction appeared to be unnecessary, Goldsborough set it aside. He refused to dismiss the 80-day injunction, saying that he was not convinced that the threat of a coal strike had been removed. The Court requested that a brief be filed and announced that it would take the Government's motion under advisement and rule on it later. Incidentally, the criminal contempt convictions of Lewis and the mine workers have been appealed to a higher court.

Producing Battery Grade Manganese-Dioxide

(*Continued from page* 47)

Minimum 68% MnO_2
Maximum 2.5% Fe
Maximum 0.5% Pb
Maximum 0.03% Cu
Maximum 0.10% As

Concentrates may contain not over 10 per cent plus 10 mesh and not over 30 per cent minus 200 mesh.

As the concentrating process tends to concentrate the impurities as well as the manganese, the specifications can only be met by blending ores with differing amounts of impurities—thus a high-lead (0.6-0.7 per cent) low-copper ore or concentrate can be mixed with low-lead, high-copper (0.05 per cent) ore to make an acceptable concentrate. Obviously, excessive amounts of any of the impurities make an ore unsuitable for battery purposes.

The capacity of the upper mill is approximately 75 tons per day of coarse ore feed which is expected to be increased to 125 tons per day by the addition of a second rod mill. The lower mill has a capacity of up to 40 tons per 24 hours of battery-grade concentrates plus 1 to 5 tons of middlings.

As might be suspected from the method of concentration, recoveries are rather poor, and vary considerably with the grade and type of ore. Certain ores appear to be so finely divided and contain other manganese oxides so that it is practically impossible to bring them to the required 68 per cent MnO_2 grade. Other ores, lower in grade, are a mixture of relatively high grade MnO_2 with gangue which can be easily removed by tabling, leaving a high grade concentrate. On an average, recovery in the tabling operation is in the range of 60-80 per cent on 35-40 per cent MnO_2 ores and magnetic separation of 45 per cent material is in the range of 85-90 per cent giving an overall recovery of 50-75 per cent. On ores below 30 per cent MnO_2, overall recovery is generally less than 50 per cent. Experience here has been confined to minus 8-mesh feed and the coarse fractions separate readily. Below 200-mesh, if the particles contain much gangue, dust is created by turbulence between the poles and the rapidly moving cross belts and is swept into the concentrate reducing the grade. Thus only on high grade feed is it possible to make acceptable concentrate grade when the feed is minus 200 mesh.

Flotation is believed to produce a product deleterious for battery use and recoveries to date have been generally not as good or no better than gravity plus magnetic separation.

1948 Coal Convention Marks 25 Years of Progress

Hundreds gathered at the annual banquet commemorating a quarter century of accomplishment by men of the coal mining industry.

LAST YEAR'S bituminous and anthracite production of 676,000,000 tons, plus the outlook for even greater production in the future, indicated that the 1948 Coal Convention would follow the same trend of expansion. Realization kept in tune with expectations. Despite the fact that a 29-day strike by the coal miners preceded the convention, more than 1800 operators and manufacturers' representatives were on hand to discuss the problems of the coal mining industry at the Netherland Plaza Hotel in Cincinnati, April 26-28.

No exposition of mining equipment took place at this year's Convention but the unusually high attendance signified the success of the efforts of T. G. Gerow, National Chairman of the Program Committee, and an exceptionally able membership drawn from operating companies and manufacturing concerns. The 33 members of this Program Committee did an outstanding job in bringing to those who attended the Coal Convention an excellent group of papers of both general and specific interest to those concerned with the steady progress of coal mining.

Opening Session Draws Huge Gathering

On Monday morning the opening session was preceded by the premiere showing of the motion picture film entitled, "Ohio and Its Mineral Resources." This showing induced those who had already registered to take their seats prior to the formal opening of the Convention. The Convention was officially opened at 10 o'clock by Julian D. Conover, Secretary, American Mining Congress, who welcomed the nearly 1000 men gathered in the Pavillon Caprice.

Pointing out that this meeting marked both the 50th Anniversary of the founding of the American Mining Congress and the 25th Anniversary of its Coal Conventions and Expositions, Mr. Conover stressed the great accomplishments of the industry during these periods. He stated that 90 per cent of all the bituminous coal ever mined in this country had been produced in the past half century and over half of the total since the work of the Coal Division was started in 1924.

After reviewing the industrial de-

velopment of America—based primarily upon utilization of mineral resources—he went on to say, "The art of mining coal has kept pace with the progress in other branches of American industry; and this has been notably true in these 25 years since the best brains of our industry began to assemble here at Cincinnati.

"That first meeting, back in 1924, marked the acceptance of the idea that the back-breaking labor of coal mining could and should be performed by machines—that coal operators and manufacturers should combine their efforts to adapt modern mechanical techniques to the entire cycle of coal production, from the face to the railroad car."

Through such efforts, Conover said, "our coal industry, bituminous and anthracite, deep mining and strip mining, has been brought to far higher levels of safety and efficiency—with higher wages and greater production per man—than any other nation in the world.

"What has been done so far, however, is only a foretaste of what is to come. The opportunities for applying ingenuity to every phase of coal production, preparation, and marketing are greater today than ever before. The greater natural difficulties of mining, with an increasing proportion of our coal coming from thinner and lower-quality seams, can and will be overcome. The coal industry must prepare now to meet the demands arising from a growing population, a constantly expanding use of power, greater industrial requirements, increased exports, and—before many years—the need to supplement natural oil and gas with synthetic fuels.

"As we look ahead, we are confident that the achievements of the future will far outdistance anything that we have seen in the past; and at the 75th Anniversary of the American Mining Congress and the Golden Anniversary of our Coal Conventions and Expositions, the forward-looking, aggressive operators and manufacturers of 1973 will report another generation of progress which will add new lustre to the mining industry's record of service to our country."

Speakers at the opening session and Convention officials: G. B. Southward, Charles W. Connor, Charles E. Hemminger, John I. Yellott, James Boyd, T. G. Gerow, and Julian D. Conover.

He then presented T. G. Gerow, Program Committee Chairman, who conducted the morning session devoted to the general subject of the "Outlook for Coal." First speaker was Dr. James Boyd, Director of the U. S. Bureau of Mines, who discussed "Coal Conservation." Dr. Boyd urged the industry's attention to more complete extraction of the coal now being mined and cited the need for greater attention to safety as steps in the right direction towards true conservation.

John I. Yellott, Director of Research, Locomotive Development Committee, presented an address entitled "Increasing the Utilization of Coal," in which he elaborated upon the research now being undertaken to develop more uses for coal and to achieve greater efficiency from the coal being consumed in power development. Charles E. Hemminger, Senior

Members of the Manufacturers' Division reviewed the year's activity and made plans for the future.

At the Tuesday luncheon H. A. Winne, vice president, General Electric Co., discussed the industrial application of nuclear energy.

Engineering Associate, Standard Oil Development Co., Elizabeth, N. J., outlined the role that coal will play in the manufacture of synthetic fuels and presented some extremely interesting figures on the cost of liquid fuels produced from various sources.

At a special luncheon session, presided over by Harry M. Moses, Chairman of the AMC Coal Division, Shaw Livermore, Consultant to the House Select Committee on Foreign Aid, described the impact of the European Recovery Program upon the coal industry. He also outlined the effect the program would have upon steel consumption, expressing the view that adequate steel would be available to meet mining equipment needs.

Concurrent sessions on underground haulage and strip mining were well attended by men eager to learn of the new developments that have taken place and of the methods by which specific problems have been solved. A series of interesting photographs and an illuminated display illustrated reclamation and reforestation methods being applied to spoil banks and abandoned open pits in several strip-mining states. The interest of strip-mine operators in reclamation measures was indicated by the fine attendance at the session where experts in the field of strip-land reclamation gave an over-all view of the various methods in use. Haulage problems were given serious consideration as one of the major factors in coal-mine operating.

Manufacturers Division Meets

Also on Monday afternoon, the Manufacturers Division of the American Mining Congress met, with Chairman J. J. Huether presiding. Secretary Conover presented a detailed report of the activities of the Manufacturers Division during the past year and the problems relating to the Convention and Exposition. Plans for the San Francisco Metal Mining Convention and Exposition in September of this year and the 1949 Coal Show at Cleveland were discussed and a survey report was presented giving reactions of the coal operators who attended the 1947 Coal Show.

On Tuesday morning, the General Session drew a full house to hear industry experts present vigorous programs for attracting young men to coal mining, for developing supervisory personnel, and for promoting greater safety in coal mining. At a luncheon, held in the Hall of Mirrors, H. A. Winne, vice-president in charge of engineering, General Electric Co., was introduced by J. J. Huether and presented a clear picture of the industrial application of atomic energy. He outlined some of the vital problems that must be solved before nuclear energy may be satisfactorily applied to the production of power.

During Tuesday afternoon, three sessions ran concurrently. Face Prep-

Technical sessions drew interested audiences to the Pavillon Caprice.

aratory, Maintenance, and Strip Mining Sessions drew large numbers of the convention-goers to hear the fine papers presented.

Following a pre-session motion picture premiere entitled "Magnesium—A Metal from the Sea," on Wednesday morning, several notable papers were presented on surface preparation. In the afternoon, the Mechanical Mining and Strip Mining Sessions, taking place at the same time, had an excellent attendance of interested coal-mining men.

Session Chairmen

Much credit for the fine manner in which the sessions were conducted is due to the presiding chairmen who gave most generously of their time: T. G. Gerow, executive vice-president, Truax-Traer Coal Co.; Carl T. Hayden, vice-president, Sahara Coal Co.; J. J. Huether, General Electric Co.; J. T. Littlepage, Greenland Coal Corp.; V. O. Murray, general manager, Union Pacific Coal Co.; D. L. McElroy, vice-president, Pittsburgh Consolidation Coal Co.; A. J. Ruffini, vice-president, Powhatan Mining Co.; William H. Cooke, president, Little Sister Coal Corp.; George M. Rigg, vice-president, Weirton Coal Co.; John T. Parker, superintendent, Inland Steel Co.; Robert P. Koenig, president, Ayrshire Collieries Corp.; and V. C. Kibler, Blackfoot Coal & Land Corp.

Under the guidance of Charles W. Connor, Chairman of the Floor Committee, a group of ten members were responsible for the smoothness with which events moved throughout the three-day Convention. The entire coal industry owes all the hard-working men of these committees a vote of thanks and appreciation for implementing a program of unusual interest.

Abstracts of the convention papers appear on the following pages. The complete record of Convention proceedings will appear in the 1948 Coal Mine Modernization Year Book.

Entertainment

On Monday evening the annual Coal Miners Party took place in the lovely Pavillon Caprice. Free beer was had by all, along with the usual thirst-provoking snacks. A fine group of performers put on a varied show that lasted almost two hours. In the course of the evening, Eddie Clark, the insulting waiter, upset the equanimity of several tables with his amusing antics. The relaxation and opportunity to meet with old friends and make new ones was a capping climax to the first day of attending technical sessions.

Coming on the evening of the last day of the Convention, the Annual Banquet, commemorating 25 years of Coal Mining Conventions and honoring past presidents and past chairmen of the Coal Division, of the Program Committee, and of the Manufacturers Division, was held in the Hall of Mirrors of the Netherland Plaza. Crowded to capacity, the overflow from the main floor was seated at tables placed on the balcony and in the adjoining hall. Following an excellent dinner, T. G. Gerow, toastmaster for the occasion, presented the men seated at the head table in whose honor the banquet was held. He also honored those who were unable to attend by pointing out their service to the industry throughout the 25 years of activity of the Coal Division of the American Mining Congress.

After a satisfying dinner, the Hon. James D. Arrington, Mayor of Collins, Miss., was introduced as the guest speaker of the evening. The subject of his inspiring talk was "Yesterday, Today, and Tomorrow." He held the attention of the audience as he put across his theme in an extremely humorous fashion.

Then the tables turned in the other direction to watch the top-flight entertainment program that was arranged for the evening's enjoyment. For two hours a varied group of vaudeville acts performed by exceptionally able talent earned the unanimous approval of all.

Ladies' Activities

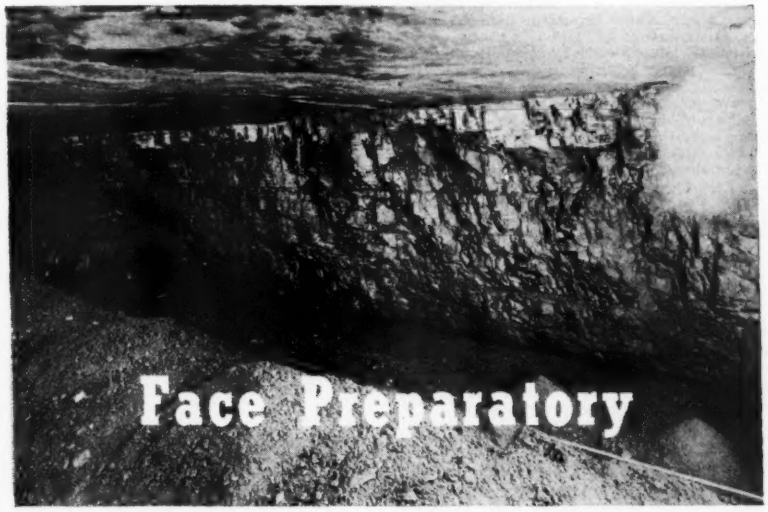
More than 50 ladies attended the series of social functions designed to entertain them while their husbands were busy attending the technical and business sessions of the Convention. On Monday afternoon a delightful tea was held and on Tuesday a luncheon and bingo party were held at the Maketewah Country Club. Winners of the bingo game were awarded specially-selected prizes. The ladies were also welcome at the Coal Miners Party and the Annual Banquet, and their presence contributed greatly to the success of these events.

Looking Ahead to 1949

Plans were made at Cincinnati to hold the 1949 Coal Convention and Exposition in Cleveland. Both the exhibits and the Convention sessions will be held at the Public Auditorium, May 9-12. With more demands for greater production being placed upon the coal industry, and a concerted drive by operators and manufacturers to produce coal in greater quantities with less manual effort and at lower cost, the 1949 meeting promises to be one of real accomplishment as the AMC Coal Division embarks upon its second quarter century of service to the coal mining industry.

Papers on strip mining focused on current problems.

Abstracts of Convention Papers



Machine Cutting With Tungsten Carbide Bits

By H. H. Fletcher
Dickinson Fuel Co.

EXPERIENCE with small mines in the Kanawha District, in West Virginia, indicates that few if any aids afforded industry are more dramatic, more sensational, and more revolutionary than the cutting edges of the tungsten carbide tipped tools.

Undercutting coal is a fundamental operation in mining; it is mining, and the boss usually tells us if he can get the coal cut, he can get it loaded. We like to think of a mining machine as a coal saw, with the business end on the cutter bar. If a crew were required to work a hand-operated saw with 10 per cent of the teeth missing, the others dull, and gauged with the finger, we should be indicted for cruelty to animals. But when they are driven electrically and mechanically, we find cutting machines promiscuously operated with dead lugs, dull bits, and bits not to gauge. It is not difficult for an interested operator, with a little cooperation from his foreman, to reduce the dead lugs and have a proper gauge, but to keep sharp bits always in the chain means that management must climb out of the rut.

Due to Mr. Fletcher's death, this paper, prepared by him, was presented by C. E. Craigo, chief electrician, Dickinson Fuel Co.

In 1934 our No. 1 Mine was operating in the Winifrede seam, producing 800 tons a day, undercutting in slate for additional height. We employed three blacksmiths, hand forging ½ by 1-in. bits, quenching in oil or water. About this time an enterprising welder persuaded us to experiment with tipping our bits with borod; by this means we were able to reduce our blacksmiths from three to one. We do not retain records after five years, but over this experimental period we have, however, kept the same mechanics and it is their studied judgment that the repair cost to our machines has been reduced by two-thirds. Later we introduced a 50 lb power hammer and dies, which forms bits faster and uniform. One blacksmith now manages the bits and all the other work flowing into the shop of a hand-operated mine of 800 tons' capacity, and in 1947 our cost per ton for bits was .0125c. We submit that this can be looked upon as a substantial and simple solution of a tough cutting problem for a small coal mine.

Our No. 2 Mine operates in the Powellton seam. Predominately, undercutting has not been a special problem and we experimented with the different wares brought to our door. Since men who had both a knowledge of forging and autogenous welding could not always be employed, and because the local management felt other phases of mining more important, we never installed the method that worked so successfully for Mine No. 1. The system of least resistance in supplying cutting bits to our machines, while generally adequate, was not always successful.

In the course of the development, we exposed a section with the cutting area saturated with jack rock or sulfur balls in a vicious form which made it impossible to undercut the coal with any tools we then had or knew about. As a consequence, several thousand tons were abandoned. Later, in two other sections this experience was repeated but, being reluctant to give up so much of our acreage, we persisted in mining until our machines were practically wrecked.

In 1947 it was important to drive entries through this barrier of vicious sulfur balls. The attack was started with ½ by 1-in. bits represented as special steel, prepared on Sullivan machines and heat treated. Progress soon stalled and the machines were suffering severe damage. At this stage the chains were fitted with U1 tungsten carbide bits, and these made it possible to keep the development on schedule. The tons per face man were not reduced below the average for normal mining and the machines were not unduly damaged, but it was not inexpensive cutting. A machine has been known to reach the left rib with a full complement of costly bits destroyed.

Next, the U8 tungsten carbide bits were introduced. The results have been revealing to the mine officials, and we believe even to the manufacturers. The hard boulders were not dragged out—they were cut. Tool marks that simulated those left by a chipping hammer, or a lathe bit working on cast iron, showed in specimens brought out by the chain. This layman has understood that tungsten carbide is ideal for resisting abrasion, but that it is not recommended to withstand shock. You will have to accept our word that these formations are hard and stubborn, and it appears to us that if tungsten carbide is sufficiently backed by base metal, it will withstand shock. The U8 bits were so successful, it was practical not only to drive through the hard barrier, but on the way back, to take out rooms that had been abandoned.

There is a perennial search for an alloy that has both hardness and tensile strength, and in the field of machine tools inserted metal has made a telling contribution towards the solution of this problem. Tungsten carbide when applied to mining machine cutting bits does offer to the managements of coal mines a challenge, which for the time being we have accepted. In every case it has not been voluntary since we knew of no alternative but to abandon our coal. If we have to train our workmen to care for and appreciate fine and expensive tools, we have the feeling this might be healthy. It will tend to form habits that will reward the employers when other expensive equipment is placed in their hands. Certainly the trend is not in the direction of the pickax and mule haulage.

Mechanical Kerf Cleaning

By V. D. Hanson,
Mechanical Engineer
Pittsburgh Coal Co.

IN dealing with automatic bug dust removal and its resultant improvement on face preparation, it was decided to go over the background of this type of work sketchily and then present slides showing what has been done by various manufacturers to provide automatic bug dusting, as well as operating data from various coal fields.

On April 11, 1940, a paper was read before the Midland Institute of Mining Engineers at Sheffield, England, entitled "Coal-Cutting, With Mechanical Gummers, With Special Reference to Kerf Widths and Depths." The paper states that its purpose was to present "practical results from experience with the device that had been recently accepted as the most important contribution to improved coal-cutting with far-reaching effects on safety and economical mining." They also pointed out, "it is generally recognized that the efficiency of coal preparation depends upon the work of the men who follow the cutting machine to clean out the kerf. In this connection it is known that the cuttings taken back into the kerf tend to pack tightly at the back of the cut from which position the work of getting them out is the most difficult, yet it is at the back that a cleared space is necessary to induce a clean break."

We all know that the quantity of explosives necessary in each shot, plus the number of shots is dependent on the effectiveness of the bug dusting. This in turn affects size consist, roof control, ease of loading and production plus effective loading machine performance. As in England, we find that the absence of dust, improved preparation, with resultant safer shooting and the practical elimination of one man's labor, as well as lower power consumption improved bit life, and lower maintenance costs make automatic bug dust removal of vital interest.

The following data is based on three different operations in English mines using a 6-in. kerf:

Mine	Power Savings	Efficiency Cuttings Removed	Percent Inclusive ½-in.
A	31.7	78.7	3.85
B	27.8	80.2	6.9
C	24.2	80.6	10.1

At our mines with a 6-in. kerf we find:

Power savings..... 14.0 to 28 per cent
Cuttings removed .... 76 to 85.0 per cent
Per cent inclusive ½-in. No data.

Following descriptions of operations with three types of bugdusters, the paper concludes:

In determining the efficiency of the amount of bug dust removed, it was noted that the miners had a tendency not to sump the machine in the full depth with an excellent job of bug dust removal. When the machine was sumped in the full way at these mines, where they were carefully supervised, a small amount of bug dusting was needed. At no place were we able to obtain information on the bug dusting machines being used where water stood free at the face. It appears that the bug dusting machine lends itself to an excellent way of spraying the coal at the back of the machine with resultant lower maintenance on the chain and bar.

It has been noted that several operators desire that the bug duster should be of such type so that when it becomes inoperative they can continue to operate the cutting machine by a simple removal of the bug dusting device. In some instances the balance of the trucks has been destroyed by the addition of the bug dusting machine and this means a considerable investment by the operators in order to use the bug dusting machine. This should be considered by the manufacturers.

It has also been pointed out that on prominent types of bug dusters there is a tendency to jam by foreign material plugging. These should be looked at with a critical eye by the engineers of the various manufacturers with an idea of some type of a slipping clutch which has already been provided by one manufacturer to such an extent that no mechanical trouble results. We have found that the finer the coal is broken in cutting the more difficult it appears to move the dust from the machine.

All of these machines shown, no doubt, lend themselves to the various features pointed out at the beginning of the paper. In our own mines we detect improvement in face conditions where these units are used and we believe that, in the near future, gummers will be standard equipment on cutting machines.

Timber Setting and Recovery in Trackless Mining

By G. W. McCaa,
General Superintendent
Consolidation Coal Co. (W. Va.)

THIS paper will deal with mechanical timbering machines and methods in trackless mining. The examples and illustrations used are based on conditions encountered in the Northern West Virginia section of the Pittsburgh Seam, and their application and comparison to other seams and sections of the country, of course, varies.

The usual method of timbering in the thick Pittsburgh Seam is to set two crossbars per cut on approximately 4-ft centers. Although at some operations the bars are supported by steel pins placed in holes drilled in the rib; or by a steel pin and screw jack; or by hitching either one or both ends of the bar in the rib, the usual method is to use either split or round posts. The size and length of the cross bar, of course, depend on the width of the place and the character of the roof. The intersections are usually timbered with wood or steel carrying bars.

Two types of timbering machines are used in northern West Virginia which are described as "A" and "B."

Machine "A" is similar in construction to a low vein, two-wheel drive, two-wheel steering, cable-reel shuttle car. The timbering equipment and the cable reel both use hydraulic power. The face or working end of the machine is equipped with a telescoping hydraulic jack capable of raising the timbers to a height of 7 ft 8 in. above the pavement. This jack is mounted on a swinging boom, which is hydraulically placed by a double-acting jack. The boom has a horizontal swing range of 100 deg which, combined with manipulation of the timber setter itself, will set cross bars in any required position. Underneath the boom is a second jack which can be extended to the floor. The two jacks give the effect of a solid prop when heavy timbers are lifted. The crossbars and props are carried in the bed of the car.

A 24-in. circular saw is located in the front end of the machine. The posts to be cut are placed on the table between the jack and the machine. The saw is pulled through the timber by hand, and automatically retracts and shuts off when the handle is released. The saw has an additional safety feature, for when it is in operation the rest of the timbering equipment is locked out and cannot be operated.

Machine "B" is a tractor-trailer type unit. The tractor provides the motive power, timber boom, and saw. The trailer is used to carry the timbers and other equipment. It is storage-battery powered, with one 330 amphr storage battery. It is equipped with hydraulic, two-wheel steering, and the rear wheels, which apply the tractive effort, are dual tired. Except for tramming, the machine is entirely hydraulically operated.

The machine was originally furnished with a two-wheel trailer with an 18-ft bed. The trailer was guided by maneuvering the tractor similar to a tractor trailer truck on the highway. The trailer worked well going forward but, although it was possible to guide it backing up, it required a highly skilled driver. It was thought that if the two wheels on the trailer could be steered it would simplify the tramming of the tractor trailer and would give the unit an extremely short turning radius. The idea of using a tiller man on the trailer, similar to the operation of a hook and ladder engine was tried.

The tractor-trailer type timbering machine presents additional possibilities of savings in timbering cost other than those at the face. By the use of several trailers for each timbering machine, the trailers can be loaded outside and hauled on rail trucks to the section. This will eliminate unloading timbers in a section supply yard and reloading them on the timber trailer. It will also eliminate timbers being left behind when the section advances.

With the increased use of rubber-tired equipment, a post puller was designed specifically for trackless mining. It is primarily a self-propelled, caterpillar-mounted hoist having two speeds. The dislodging pull is 20,000 lb at a speed of 15 fpm and the drag out pull is 2000 lb at a speed of 15 fpm. The hoist is held in place with two hydraulic jacks. The tramming mechanism is similar to a tractor loading machine, and the machine is equipped with a hydraulic cable reel.

A short rope with a link on one end and a hook on the other is usually used as a sling to hook around timbers to be pulled. The short rope is easier to handle and, if it should be caught under a fall, the main rope on the post puller can be unhooked without delay to the operation. The post puller is now being manufactured with a small bulldozer blade, to be used, when not pulling timbers, to level shuttle roads and scrape up loose coal on the section.

Drilling and Breaking Down Coal With Airdox

By R. L. Adams,
General Superintendent,
Old Ben Coal Corp.,

AIRDOX is the only permissible means of breaking down coal at the face on shift that is at present available to underground mines in Illinois and Indiana. Its use is being rapidly adopted in these States partly because of the many advantages of its use on shift. Such advantages are too obvious to require enumeration and, in addition, certain hazards attending the use of explosives are greatly reduced or eliminated entirely.

The equipment consists essentially of one or more air compressors capable of developing slightly more than 10,000 lb per sq in.; steel tubing tested to 20,000 lb psi to convey the compressed air from the compressors to within 150 to 300 ft of the working face; flexible copper tubing of equal strength to lead from the end of the steel tubing to the face and to which is attached the Airdox tube; line valves at all branches and at not to exceed 1000 ft intervals in all steel lines as well as at or near the end of all lines, either steel or copper; pressure gages and blow-down valves in the flexible copper tubing at a point of safety such as in the open crosscut nearest the face, preferably not closer than 40 ft to the face.

Face preparation for the breaking down operation does not materially differ from that for the use of explosives. The face may be cut horizontally at any point or may be sheared but it is questionable if both horizontal cutting and shearing is ever necessary or desirable. Undercutting only is the most common practice. Drill holes must be approximately 3½ in. in diameter to admit the Airdox tube or shell and the number of holes required is dependent upon the character of the coal and how and where the cutting is done. Since the expansive force of Airdox is far less than that of explosives, it is obvious that more drill holes are required. The type of drill used is governed entirely by the character of the coal seam and the necessity for a slightly larger hole than that required for explosives.

The purpose of this paper is to give an overall description of the installation and operation of Airdox equipment rather than a detailed description of the equipment and general specifications of the installation are first submitted.

The compressor station should be outside the mine in a substantial building with adequate openings for admitting the fully assembled compressors and for thorough ventilation at all times when the plant is running, particularly in hot weather. One line of steel tubing, 5/8 in. ID, from the compressor station into the mine is all that is required. It should be protected from freezing temperatures. The common practice is to put the line down the shaft which carries return air and along the return air passages to the working sections.

If the mine openings are a long distance from the working sections, the compressor station may be located on the surface above the working section and the air line suspended in a drill hole penetrating a return airway. This may save a quantity of steel tubing, all of which has to be maintained and protected against falls and accidental damage from other causes; however, it must not be overlooked that at least 3000 ft of line for each compressor should be in the system between compressor station and working face to serve as an air receiver. The nearer the steel line is carried to the faces the less flexible tubing will be required.

The Airdox operator, or "shooter," works alone. After the face has been cut and drilled, then the final preparation before the breaking-down work begins is to put a small amount of water in each drill hole. This can be done with an ordinary gun of the simplest type although it is advisable that it be of brass with water-resistant plunger leathers. Less than a quart of water in each drill hole is enough to prevent dust in the air following discharge of the Airdox tube.

The first act of the operator is to "block off," with appropriate signs, the working place that he is preparing to break down so as to prevent anyone else from entering the possible danger zone. He then attaches the pressure gage and blow-down valve to the flexible copper tubing that has previously been semi-permanently installed and which terminates in a crosscut or other place of safety near the face. Next, he opens the line valve to bring the compressed air up to his blow-down valve. The shell is then attached to the flexible copper tubing leading from the blow-down valve to the face and inserted in the first drill hole. The tube is pushed all the way to the back of the hole and then withdrawn about 6 inches to give a small air cushion to the discharge.

The operator then returns to the blow-down valve and gage. He opens the floating plunger valve admitting compressed air to the tube in the drill hole at the face until the gage shows the desired pressure, say 9500 lb, whereupon he gives a vocal warning of the impending discharge, closes the air supply and opens the blow-down valve. Immediately the "shell" is discharged, the sudden release of highly compressed air breaking down the coal. The tube is then inserted in the next drill hole to be used and the operation repeated until the whole face is broken down. Quite often some of the drill holes are not used because the drillers do not always judge conditions properly and, for the same reason, it is sometimes necessary to drill another hole or two to square up the rib or face properly.

Roof Support With Suspension Rods

By C. C. Conway,
Chief Engineer,
Consolidated Coal Co.

Mr. Conway's paper appears in full in this issue, beginning on page 33.

Thin Seam Mining With Self-Loading Conveyors

By P. R. Paulick
Consulting Mechanization Engineer

WHAT do we mean by a self-loading conveyor as distinguished from a plain conveyor? It is a mechanical unit wherein the driving motor, the conveying medium, and the face loading or coal pickup mechanism are all directly connected and operate as one integrated unit. The one type now being used is the Goodman shaker equipped with an attached loading head called a duckbill. It is true that there are many other different conveyors being used in American mines—chain conveyors, several makes of shakers, and many types of belt conveyors, but all must be loaded either by hand shoveling, or some type of mechanical loading device that is independent of the conveyor unit itself. Hence, due to the nature of the subject, this paper will be confined to the application of self-loading conveyors, working in thin coal seams.

Generally speaking, coal seams 42 in. and under are classified as thin, or "conveyor coal"; although it is conceded that quite an argument can be developed on this subject contrariwise. Coal seams 42 in. to 54 in. can be considered more or less as no man's land. Quite a few mines have installed mobile loaders in this seam range and are obtaining good results and, on the other hand, many operations within this same seam category are using self-loading conveyors with equally good results.

Application of self-loading conveyors can be divided into three general headings: (1) The individual unit setup;

(2) multiple setup of two or three units; and (3) the group setup wherein a group of six to ten conveyors are used discharging on a common belt conveyor.

P. R. Paulick

It has been the experience of this writer over a period of 22 years that individual unit setups (except in special, isolated cases, such as driving a supplementary aircourse, or perhaps an air tunnel connection) are never justified, are wasteful of labor, and are uneconomical to operate.

With some modifications, this also applies with equal force to the two or twin-room setup. Here again the same amount of time must be spent to service, supervise, etc., that would be required to service a larger group. So, unless dictated by special circumstances, twin-room unit self-loading conveyor installations are not recommended.

An advanced adaptation of the group system has been recently developed in several mines. One of the main disadvantages of using self-loading conveyors in room work is the moving operation from one room to the next after a place is worked out. Drives, pan lines, and duckbills must be dragged around 90 deg turns. To overcome or reduce these disadvantages, a so-called "continuous room mining" system has been developed. Briefly, this consists of two parallel entries driven abreast with a belt conveyor installed in one. At the point where the barrier stops (150 or 200 ft in by the main entry depending upon the size of barrier wanted) a set of two short entries called "cutoff" entries are turned and driven at right angles to the first two. Room necks to start the continuous rooms are turned off these short entries. A small easily portable belt conveyor "auxiliary belt" is installed in these cutoff entries. Drives for the room units are installed in the room necks provided in the cutoff entries. The room units load coal onto the auxiliary belt which in turn loads onto the main belt.

Rooms are driven up 300 ft, parallel to the two butt entries, at which point a continuous breakthrough is made across all the rooms opposite one another creating another cutoff entry where the auxiliary short belt conveyor is set up. Rooms are driven about 50 ft beyond this cutoff breakthrough to facilitate the next setup and stopped. Now all the equipment from the previous auxiliary entry is moved forward to the new auxiliary entry and reset. The duckbills, cutting machines, etc., are already up at the face ready to go. After setting up the auxiliary belt in the new cutoff breakthrough and resetting the drives, the system is ready to continue.

In this way these rooms can be driven any distance desired, depending upon the coal area available, and the desires of the mine management. Meanwhile, of course, the two main butt entry units continue driving the two main butt entries to the desired limit, 1200, 1500, or 1800 ft. After rooms are advanced to the limit, they are returned in a similar manner on the other side of the two entries. Belt is recovered as the rooms retreat to the mouth of the main entry, so that in no case is a large amount of belt either set up or recovered at any one time.

shooting, timbering, and extending the room conveyors.

The standard system described above of driving rooms 80 ft wide is used where conditions permit, but this method is flexible in that changes can be made where difficulties are encountered. If the top became such that an 80-ft room width is impractical, we then leave a pillar in the center and, in effect, work two 30- or 35-ft rooms, depending on how much pillar is required to be left. The dividing pillar is left only under the bad top, and as soon as better conditions are encountered, the full 80-ft width is resumed. A condition of this kind does necessitate tramming the cutting machine and the loader through a breakthrough from one side to another, instead of swinging directly across as in a full-room width.

The two-room conveyors discharge onto a 26-in. belt in the cross entry; this in turn discharges onto a 30-in. main entry belt, which brings the coal to the outside, discharging into a large bin. From this bin the coal is loaded into five-ton mine cars and taken through the hill to the tipple, a distance of approximately 2½ miles, where the preparation plant is located.

Thin-Seam Mining With Conveyor-Loader

By **Stanlee Hampton**, President
Tennessee Consolidated Coal Co.

OUR experience with the Jeffrey conveyor-loader has been rather brief; in fact, we are still more or less in the experimental stage, working on a trial and error method, and we are running into obstacles which we will, from time to time, no doubt work out. We will endeavor, however, to tell you just what we are doing, although our present method is likely to change at any time and in greater or less degree, due to the conditions of our seam of coal.

Our mine is located at Palmer in Grundy County, Tenn., on top of the Cumberland Mountain, at an elevation of 1835 ft above sea level, about 40 miles northwest of Chattanooga. The seam is the Sewanee; the coal is of fairly soft structure and varies in thickness, but the usual average is around 36 in. and the grade is level except for local dips and rises; the top is of both slate and sandrock and the bottom is a rather hard fire-clay.

The conveyor-loader is a chain conveyor mounted in a frame on four pneumatic tires so as to be entirely mobile, and its function is to load coal that has been shot down at the face, and transport it for a distance of 25 ft or more, discharging onto a room conveyor. The gathering head is mounted on the end of a 12-ft retractible conveyor boom—a self-contained hydraulic jack at the tail-end of the conveyor is the anchor and discharge point. This is set over the end of the room conveyor. The rear wheels are then retracted and the front wheels are swiveled 90 deg so that the loader is free to pivot in an arc. With the anchor as a pivot, the loader swings in a half circle to clean up the face 40 ft wide. The entire unit is motor driven and self-contained, and can be trammed under its own power from one working face to another.

At present we are using the loader for room work only, although it is, of course, adaptable to entry driving. Rooms are driven 80 ft wide and 300 ft deep, having two chain conveyors 40 ft apart, set 20 ft from each rib, extending from the face down to the room neck where they discharge onto a belt in the cross entry.

One loader works in a room; with a reach of 37 ft, it loads one-half of the face onto the right-hand conveyor, then the tail is swung over and pivoted on the left-hand conveyor and the left-hand half of the room is loaded out. In other words, the conveyor-loader takes two 40-ft swings. Since the loading head can be extended 12 ft, it is not difficult to clean up a 40-ft room in this loading position. The loading is a gathering action, as the head advances into the loose coal until the back of the cut is reached, then retracting and swinging a few feet to the left and repeating the operation until the entire face has been cleaned up.

The work is carried on in a continuous rotating cycle, that is, while one-half of the 80-ft room is being loaded out, the other half is being cut, timbered, drilled, and shot. The men perform the same operations, but change from one-half of the 80-ft room to the other. Two shifts are operated at present, each with a crew of seven men—a shift leader, a loader operator and helper, a cutting machine operator and helper, and two for drilling,

The Continuous Miner

By **Stanley Blose**, President,
The Consolidated Coal & Coke Co.,

IN 1926 the late Carson W. Smith, president of the Consolidated Coal & Coke Co., foresaw the coming decrease in demand for the large sizes of prepared coal. He perceived that the problem then would be the economical mining of slack coal to meet individual demands and it was obvious to him that such mining would need an entirely new type of machine, since the crushing and screening method then in use was too expensive for profitable operation. So he conceived the idea of a machine which would mine coal from the solid face, and place it into the pit car in one operation without shooting, and he began the long struggle to convince manufacturers of the potentialities of his plan. Finally, in 1947, 21 years after the conception of the original idea, the Continuous Miner was purchased by the Joy Manufacturing Co.

In operation the coal disintegrating mechanism, which is arranged to work to a height of 8 ft, and swing in a radius to a maximum width of 16 ft, is first sumped into the solid coal face and then raised to dislodge the coal in its path and convey it back and away from the face. After the coal disintegrating mechanism has moved to the desired height, it is retracted to trim the roof. The disintegrating mechanism is then again placed in the sumping position, swung to the right for another bite, and the cycle is completed again and continued until the desired width has been reached. At

this point the disintegrating mechanism is swung to the left rib, the entire machine moved ahead, and the cycle is repeated. We sump in on the left rib because the operator sits on that side and he can see that he is cutting on the bottom.

The elapsed time required to sump in and work to the top is, of course, directly dependent upon the height of the seam, but the machine is capable of delivering a continuous flow of coal into the transportation system at the rate of approximately one ton per minute.

The coal disintegrating mechanism delivers about 90 per cent of the dislodged coal back through the machine where it is transferred on to a drag conveyor which delivers it to the rear of the machine. Approximately one-half of the remaining coal is picked up from the bottom by a scroll in front of the machine and delivered to the aforementioned drag conveyor. The scroll is so designed that spillage coal is brought from either end to the center for discharge. The scroll serves to keep a path clean for the caterpillars so that the machine does not climb up from the bottom on loose coal. The remainder of the coal not handled by the machine is shoveled on to the conveyor as the machine moves along.

The coal that is dislodged from the face is delivered by the drag conveyor through the machine to a Goodman pan driven by a Goodman drive unit with an "A" motion. We are now having built ten small portable conveyors which will be rubber tire mounted, 15 ft long, and portable enough so that one man can wheel them in or out of position. We believe this will give us flexibility, together with the ability to remove the coal from the machine by the accepted transportation systems. Another possibility for transportation behind the continuous miner is to use two shuttle cars, one of which will remain behind the miner to act as a receiving hopper or surge bin, with the second shuttle car acting as the haulage unit between the surge bin and the main line haulage.

We started our continuous miner in June 1946. This machine has been experimental. We have worked and experimented with it ever since, and, in the aggregate, have produced a substantial tonnage of coal. Due to the experimental nature of our work, data as to costs, tonnage, and production would be misleading. However, we would like to point out that we have driven as much as 103 ft of entry in one shift, entries being normally 11 ft wide and approximately 7 ft high.

Belt Conveyors for Main and Gathering Service

By C. W. Thompson
Weirton Coal Company

BELT conveyor haulage is not an over night sensation that can be compared with such fads as miniature golf crazes. The adoption of it by the mining industry has been on a slow and careful but sound engineered basis. Failure of installations of such transportation methods has been exceptionally rare and meager available reports show unsound engineering at the start of the job. Private surveys indicate an increasing trend in favor, by progressive mining companies, of belt conveyor haulage not only in old times but in approximately 90 per cent of all new properties. In addition, iron ore companies are beginning installation of conveyorized haulage in underground ore mines. The above ground iron pits have practically pioneered the origin of long conveyors with increasingly larger drives.

When reasonable rules are employed to prevent injuries in the transportation of men and coal over belt conveyors, haulage fatalities and injuries are practically eliminated. Derailments, collisions, runaways, falls from roof due to wrecks, and the leaving of ventilation doors open cause explosions and fatalities. The use of conveyorized haulage can almost totally eliminate such accidents. It is not my intention to introduce the assumption that mining companies should adopt conveyorized haulage to prevent accidents but do wish to emphasize that when belt conveyor haulage is practical it is nice to look forward to a reduction or total elimination of haulage fatalities and injuries.

Freedom from interruption, which provides constant operation at the loading machine, becomes a reality with the employment of conveyorized haulage whether loading into shuttle cars or directly into chain gathering conveyors. The human element in the control of haulage is considerably reduced when using conveyor transportation.

The belt itself is essentially fragile, in some respects, particularly as to edge wear and tearing but in spite of this the belt conveyor is more reliable than any other method of haulage. In all cases of normal belt failure there is long evidence warning in the appearance of the belt of approaching trouble and repair and replacement can be scheduled to avoid interruption.

Freedom from grade restrictions is apparent when conveyorized haulage is used. Up hill, down hill, through deep swags and over high humps go rubber belts carrying material at an ever increasing rate of capacity. Run-of-mine coal is commonly hauled over grades running up to 30 per cent plus or minus and on occasions inclines up 35 per cent have been used with only a minor spillage of lumps.

Preventive maintenance should deserve attention when discussing operating practices. The following outline briefly covers important maintenance phases which should be considered:

(1) Installation of conveyor line
  (a) Proper alignment
  (b) Constant leveling
  (c) Placing conveyor line to receive proper load distribution on the belt

(2) Installation of conveyor belt
  (a) Careful handling of the belt when running conveyor line
  (b) Efficient splicing
  (c) Canting of rollers to insure against edge wear when first starting the belt
  (d) Protection against gouging, cutting and carcass breaking at transfer points

(3) Operation of belt conveyor
  (a) Systematic greasing with proper record keeping
  (b) Periodic examination and the recording of same
  (c) Use of wattmeter charts to reveal adverse friction
  (d) Absolute cleanliness
    (1) Tail end of conveyor
    (2) Transfer stations
    (3) Loading decks
    (4) Entire length of conveyor line
  (e) Proper loading of belt to insure good pattern wear

Present Needs: Conveyor and belt manufacturing companies should continue research and development on the following:

(1) A device to properly clean the loaded side of conveyor belts
  (a) Such a device should be effective and practical
    (1) The device should be so constructed that it would not damage belt cover

(2) Transfer hoppers, where one belt dumps on another either at 90 deg

or end to end, should be developed to provide:
(a) Elimination of coal spillage
(b) Maximum protection to belt cover

(3) Self adjusting idlers for the under or return side of the belt conveyor
(a) Such idlers are furnished for above ground use and should be designed for underground service
(1) Should be built with height limitation as major consideration

(4) Possibilities of application of stainless steel wearing strips to edge of belt. Such protection could be imbedded in rubber which covers fabric at the side of the belt
(a) Such protection would have a tendency to make it harder to wear through to fabric.

Haulage System for Operating Track-Mounted Equipment

By **Joe Bose**, Superintendent,
Templeton Coal Company,
and
J. W. Anstead, Electrical Engineer,
Linton-Summit Coal Company

WHEN the Linton-Summit Coal Co. decided early in the year 1945 to sink a new mine in Sullivan County, Ind., one of the first important decisions that had to be made was what mining system and type of mechanical equipment would be employed in order to obtain the most satisfactory results. As a result of this study, high capacity, track-mounted loading and cutting equipment was chosen for the face workings with mine car haulage underground and a belt conveyor slope from the coal to the surface.

The seam mined is the No. 6 which averages 5 ft 4 in. in thickness and is underlaid with fireclay, topped with a 5-in. band of slate that provides a hard bottom. The roof is composed of gray slate which provides a good top condition except in the presence of rolls where slips require crossbars. Grades up to approximately 7 per cent may be found in rooms.

The slope was driven by a track-mounted loader; it is on a 17 deg pitch and is 18 ft wide, 7 ft high and 535 ft long from the surface to the No. 6 seam. It was driven a total distance of 650 ft to provide a dump bin under the main haulageway. When sinking operations were started, the first 50 ft of overburden was removed with a dragline; the remaining distance of 485 ft was driven by using a track loader, a cable hoist and 90-cu ft steel car. A set-off switch was placed at approximately 150-ft intervals to allow the track loader to be parked in the slope, so that it was not brought to the surface during the preparation phase of the face cycle. After a round of rock was shot, the loader was attached to the front of the steel mine car which in turn was fastened to the hoist rope and lowered to the face where the fall of rock was loaded. The sinking operation moved along with such success that the second and third shifts were started with the result that three shifts per day, with a six-day week, averaged 75 ft of lineal advance per week.

The coal is broken "on shift" by Airdox and is loaded by high capacity, track-mounted loading machines. The cars are placed at the loader in four-car trips by six-ton cable reel locomotives. Following the loading machine, a slate man and timber man scale down loose roof and set the necessary props. Completing the cycle, the track crew extend the rail to within 7 ft of the face, making it ready for the cutting crew to enter. This continuous cycle is followed in each working place.

The main line haulage track is laid with 60 lb rail with treated wood ties, which are 5 by 7 in. by 6 ft. In the cross or room entries 40 lb rail is laid on treated wood ties 3 by 5 in. by 5½ ft. With one exception, all room sections use 30 lb rail on No. 3 steel ties; the one exception is in that section where prefabricated track is being use; this is 40-lb rail on No. 5 steel ties.

Drop-bottom mine cars of five-ton capacity transport the coal from the loader to an 80-ton underground bin at the slope bottom. Coal is fed from the hopper onto a 48-in. belt conveyor 50 ft long by reciprocating cross feeders. This conveyor deposits the coal onto a 42-in. belt laid up the slope and discharging directly into 40-ton railroad cars. The slope belt measures 715 ft from center to center and travels at a speed of 350 fpm. It is powered by 150 hp, 2300 v a-c motors.

Five track-mounted loading machines are used in this mine; all are in operation on the day shift and two machines work on the night shift. These seven machine shifts are producing an average of 3850 tons of raw coal per day.

A total of 40 five-ton, drop-bottom cars handle all of the tonnage produced from the five working sections on the day shift and the two on the night shift. This means that on the day shift, with a tonnage of 2750 tons, each car is loaded 13.8 times during the shift. The mine uses 14 six-ton cable reel locomotives. Each mechanical loader is served by two six-ton locomotives and eight mine cars, one locomotive acting as a relay motor. Each day shift relay locomotive makes an average of 27½ round trips per 7½-hr shift. The average round-trip haul is 4600 ft.

Combination of Track and Belt Conveyors

By **Charles R. Bourland**, Asst. to
Vice-President
The New River Co.

IT IS not the intent of this article to answer the question when is it best to use a combination of track and belt haulage, but simply to describe two successful operations of The New River Company, in southern West Virginia, where this method of transportation is used.

The Garden Ground mine which started production in December 1945—has been doing in excess of 2500 tons per day from the Sewell seam, the coal being from 36 to 42 in. in thickness. The coal bed pitches an average of about 3½ per cent, lies near the top of the hills in two long narrow ridges, with a maximum width of 2500 ft. From previous experience in adjoining property and from crop stripping in the area it was known the top would be extremely weak and require cross timber support and close posting. Under these conditions, with our coal, which will not break freely, the first decision was to use chain conveyors with hand shoveling.

The coal bed, lying in the ridges, has a maximum width of 2500 ft. It was easy to decide that belts should be used with dumping points in daylight, especially since brushing top or bottom for height would have been necessary had it been decided to take mine cars to the mouth of rooms. Since the seam pitched at about 3½ per cent and the overburden indicated a maximum recovery of 80 per cent, the belt dumping points were located on the higher side of the ridge, belt entries planned to be driven to the dip, and all room recovery work planned on the retreat. It was believed this layout would dump behind us much of the roof trouble and would allow breaking outside so that water would not hinder recovery of room coal.

Crop stripping had been proved in that area and was fast as well as profitable, so it seemed logical to recover the crop coal first and lay track on the strip bench to the belt discharge points, inasmuch as the irregular alignment of the crop prevented the use of belts on it. And even if this factor could have been overcome then the small tonnage recovered—by such main line belt installation—would have made the whole project uneconomical. With all these points taken into consideration the development was made and has worked out as planned. The strip contractor was required to leave a properly graded, shaped and drained subgrade to receive double track. Drifts were made on 640-ft centers with double track extending by all of them, with turnouts spaced midway between the drifts to allow empty cars to be fed into one end of the siding; the cars to be pulled past the belt loading points and loads to be taken from the other end of the siding.

The trips are pulled by 12,000-lb hoists acting through double sheaves anchored in the track, and the rope is returned to the starting point by small hoists with 300-ft rope speeds. Both hoists are located at the boom attendant's platform, and when loads are being pulled off, the trip remaining is held by automatic car stops attached to the rails. Track is of 100-lb rail, thermit welded, and ballasted with crushed stone; track near active loading points is of 60-lb rail, bolted, and ballasted. The operation has a 600-ton storage bin and drop bottom cars which average loading 8½ tons net. The tipple operates one shift; the faces operate two; with this arrangement 2600 to 2700 tons can be dumped in one regular shift using five locomotive crews—three on the dumping shift (one of which handles coal stored by the preceding shift), and two on the second shift. Average haul on track is about 5500 ft, and 13-ton locomotives are used in tandem.

Our Lochgelly mine presented an entirely different problem; this is located in the Sewell seam in Fayette County, W. Va. It is some 40 years old and from the hoisting shaft to the face is about four miles. The hoisting shaft is small, according to present day ideas, so that the largest mine car possible of use loads three tons. In 1946, due to the acquisition of new property, additional territory was assigned to the mine, in the form of a panel 3600 ft wide and 10,000 ft long.

We started development of the main haulageway, and our feelings (and perhaps our comments) may be imagined when the first 1200 ft went down 86 ft or 7.1 per cent without a break in grade. Obviously locomotive haulage on rails was impractical.

We had in operation at three other

mines successful rope haulage installations, where similar grades had been encountered, and considered we knew something of that method, so we set about making complete, careful estimates comparing rope haulage with main line belts.

When costs of the two plans were estimated, the capital investment, including taking of slate for height, less estimated salvage at the end of seven years showed a difference of only 2.6 per cent in favor of the rope. In the matter of operating labor it was an entirely different story. With the actual labor estimated we included cost of power (which became quite on item since we purchase power on a tariff based largely on demand). On this basis, the operating cost for the seven years involved a difference of $549,000 in favor of the belt.

The answer is obvious. The job was executed as planned and estimated, and at the moment some 3000 ft of main line belt is taking the discharge from three gathering belts on development; the hoists on the two tracks are working all right as are the chutes, and we believe the job will easily handle 1000 tons per shift. Neither of these jobs allows much room for argument, and we are happy with the combination of belts and mine cars.

Preventive Maintenance for Face Equipment

By **H. C. Bean, Superintendent, Walter Bledsoe & Co.**

THE purpose of this paper is to present some ideas on the application of preventive maintenance practices to face equipment. It is not my intention to record what *is* being done, but rather to express some ideas on what *should* be done. Because of the wide variety of equipment used and the infinite variety of conditions met in coal mines all over the country, the subject will be discussed in a general way rather than in a specific way.

Stress will be laid on the necessity for management to get into the subject of machine maintenance, and it is hoped that the ideas expressed will be food for thought for the supervisory and operating personnel in considering their maintenance problems.

In considering the importance of preventive maintenance, it must not be forgotten that under many situations a delay in any one of the major units (cutting machines, drills, loading machines, or gathering equipment) forces a delay in all of the other machines. In other words, an hour's down time on a cutting machine might be reflected in a similar hour's down time on drills and loading machines. We get a sort of "chain reaction" which makes it even more important that all machines be kept in condition to operate when they should. When we stop to consider that an hour of productive time can never be regained, it becomes apparent that under the conditions we have supposed, a delay of one hour per week would result in reducing production by 3 per cent and increasing cost per ton by nearly 1.5 per cent.

It is the prevention of these small profit leaks that preventive maintenance is intended to accomplish. When machines are operated without regard for their condition, breakdowns are sure to happen. On the other hand, when proper attention is paid to keeping the machines in good condition on a continuing basis, the frequency and severity of breakdowns is sure to be reduced. Preventive maintenance is the "stitch in time that saves nine" when it comes to production and cost.

We mentioned "profit leaks" above. That is exactly what cutting machine, drill, loading machine, or gathering equipment break-down time really is. It cannot be expected that the full significance of this down time will be appreciated by the men directly involved in the production of coal; too, often, mechanical or electrical delays afford a welcome opportunity to relax and take it easy. It is therefore up to *management* to recognize the problems and to set up the proper organization and methods to keep such delays at a minimum, without spending so much money that the extra profit gained is all used up in the process.

When it is considered that the machines must be maintained, whether by "breakdown" maintenance or by "preventive" maintenance; when it is realized that preventive maintenance costs less than breakdown maintenance; and when it is realized the preventive maintenance will result in higher production and lower unit cost of producing coal, the wisdom of setting up proper preventive maintenance practices permits of no argument. Once this principle is accepted, it remains for management to determine the general outlines of the problem, to sympathetically aid in the search for adequate solutions, and to formulate policies which will make it easy for the operating personnel to carry out the needed work in each individual case. It is my purpose in the following sections of this paper to present a generalized picture of how this might be done.

Mr. Bean then discussed the need for proper machine operation and described in detail possible practices, lubrication, methods of making minor repairs during the shift, the importance of maintenance records, organizing the maintenance department, and concluded with the following summary:

This discussion has outlined some of the major points involved in setting up a proper preventive maintenance program for face equipment. We have not tried to cover the tying-in of preventive maintenance on all the equipment necessary to keep mine and tipple operating. However, if a start is made on face equipment, it is inevitable that all the other equipment will eventually be tied in, since the need for preventive maintenance is universal. Careful attention by management to this task of keeping equipment operating will be well repaid in greater production, lower cost, and hence greater profits.

Belt-Care and Maintenance to Increase Life

By **J. A. Bottomley, Superintendent, Sahara Coal Company**

"SAFEGUARDING Conveyor Belts" would probably be a more nearly correct title to this paper because that is actually our prime consideration. The belt, as it is received from the factory, is capable of doing the work for which it is intended, and with the proper initial care its life will be as expected. As one belt engineer has said, in using a well

known slogan, "save the surface and you save all." Of course, the amount of care in installation and the amount of money spent on an installation can only be determined after a careful study of the ecoomics involved.

A permanent belt installation such as the main slope belt and some main haulage belts underground usually receive better initial care in installation than the secondary belts and room entry belts. Such permanent installations generally are favored with expert attention by the manufacturers of both the conveyor and the belt itself. Close attention is paid to loading and discharge points with reference to chutes and guards. Proper alignment and support of the structure is also taken care of which results in a good installation. Such is not the case with the narrow underground belts which are being lengthened and changed at intervals. As they are only temporary as to their location, they are handled in such a way that they receive considerable abuse. Spillage from poor loading is usually the rule rather than the exception. Initial training is not carefully considered and as belts become worn and stretched, this becomes more difficult. Side guide idlers are often used to assist in initial training of a belt but caution should be exercised in their use as permanent injury to the edges of the belt may result.

The subject of training the belt is one of the most important to be discussed, as poor alignment usually causes the first damage. As in the case of a new automobile, the hazardous period in the life of a belt is immediately after installation. If one portion of the line runs off center at any point the belt is not cut squarely. If all portions run off center at a given point the equipment is at fault. Good practice underground dictates setting your conveyor on transit lines; lining up by eye or getting on approximate location with reference to the rib is not good enough. The conveyor must be level laterally, that is, at right angle to the run of the belt in order to obtain proper training. It is a well-known fact that the belt will travel to the high side, but it is surprising how little attention is paid to the proper leveling of the supports. Here again, because of a so-called temporary installation, too little attention is paid to the proper support of the conveyor. A permanent installation on wood blocks should be checked for level at intervals to guard against deterioration of the blocking and subsequent settling of the conveyor frame.

Self-aligning troughing rollers and return idlers are good when used for the purpose intended, but I do not believe any manufacturer intended such a device to overcome poor installation or design of a conveyor. The self-aligning rollers and idlers do exceptional service when dirt collected on rollers causes the belt to move laterally. Off-center loading, which often occurs, will cause a belt to run to one side and here again the self-aligning devices are of great help.

The edge wear and damage to a belt due to improper training is often the start of the destruction of a good piece of equipment. One company I know of insists that no installation or extension be attempted without an engineer's transit spads being placed on line from 25 to 50 ft apart. As the conveyor is extended two men follow along aligning and leveling the conveyor frame. As a result, when the last section is bolted in place, the entire extension is properly leveled and in line. With this procedure, this company has been able to have a new installation of 42-in. belt conveyor operating perfectly under full load within an hour after completion. They state that only minor adjustments of troughing rollers are necessary after the load comes on to obtain satisfactory training of the belt. Troughing rollers and return idlers are set from accurately measured 50-ft marks on the conveyor frame; these marks are located with a steel tape to insure the rollers being at right angles to the run of the belt.

Breaks and cuts in the belt are usually caused from falls of roof or large lumps of coal, but if the loading chutes are properly arranged, little damage from lumps of coal will occur at that place. A common practice at loading points is to have a straight discharge on to the belt from right angles, with an attempt to control spillage with high sideboards. With such an arrangement the belt receives considerable impact from large lumps and center loading is almost impossible. A proper chute should turn the coal so it will fall parallel with the belt and thereby provide center loading and reduce the impact of the lumps.

There is always considerable hazard at a transfer point and usually some mechanical safeguard is installed to interrupt the control current and stop the belt, if a pile-up of coal occurs. Large lumps are loaded at times and the chute at a transfer point may be blocked; with a safeguard installed, when the coal builds up to a predetermined point it will trip a paddle or lever which interrupts the control circuit. There are a number of ways such an arrangement may be worked out depending on local conditions.

In conclusion I wish to repeat that maintenance of conveyor belts in a coal mine is essentially a job of safeguarding them. The nature of the work is such that they are subjected to all manner of hazards and for that reason "preventive maintenance is paramount."

POWER DISTRIBUTION SPECIFICATIONS

By **L. D. Siniff,**

Mechanical and Electrical Engineer, Consolidation Coal Co. (Ky.)

Mr. Siniff's paper appeared in full in the May issue of MINING CONGRESS JOURNAL.

DEVELOPING SUPERVISORY PERSONNEL

By **R. W. Beamer,**
Training Supervisor,
Rochester & Pittsburgh Coal Co.

SUPERVISION means directing the work of others. The good supervisor is the individual who has the ability to manage so that workers perform the duties required, in an acceptable manner, and within a reasonable amount of time. Management recognizes that good supervision is essential to the success of a business enterprise. It is supervision that translates management into action. The efforts of management are channelled to the first line supervisor who directs the work of producing goods. For this reason, one of the first responsibilities of those directing an organization is to build and maintain an efficient supervisory force.

There are certain things which management does to aid the various levels of supervision to function properly. One is setting up an organization so that each individual's job is properly defined. He knows what he is expected to do. He knows his relationship with other members of the organization. He understands line authority and the relation of staff and service officials to his own work. Another is the establishing of rules, regulations, policies, and procedures which serve as a guide to the various officials in carrying out their responsibilities. Service departments, such as maintenance, engineering, product control, safety, personnel, etc., are available to assist the supervisory personnel in specific functions. These and similar aids in themselves will not get results. There must be men who know how to work within an organization; who know the rules, regulations and policies, and who understand the standards and functions of the service departments. Above all, they must be able to secure satisfactory production from their workers. They are key men in the management organization. Not

only does this group perform an important function in management, but also, it is from this group that men are selected to fill a high percentage of the jobs at higher levels within the organization. Thus, management has both a present and a future interest in developing supervisory personnel.

The Increasing Need for Competent Supervisors

A major portion of the coal industry faced a condition largely due to the great increase in mechanization. Mines required three to four times the number of officials needed for hand-loading conditions. With the change from contract rates for hand loading, the miner was given an hourly rate. The supervisor experienced under hand loading had to adjust himself to a new job. Formerly, with the contract or tonnage rate, the worker had an incentive to produce. This incentive was lost when the worker went on an hourly rate. In some way it was up to the supervisor to create incentive. This he had not been accustomed to doing. He had facilitated production and had been responsible for safety requirements, company rules and policies, but the contract worker had the responsibility "to get the coal." As one supervisor aptly summarized the situation, "It used to be (under hand loading) if a man didn't work he didn't eat, now (under mechanical conditions) if he doesn't work the boss doesn't eat." The boss did have a new and an extremely difficult problem to solve. He needed help. It took time and experience for him to adjust his methods to meet this new supervisory problem.

New conditions and new problems make it imperative for the mining industry to give greater attention to the development of personnel for supervisory positions. Our thinking on this subject may be broken down into four steps:

(1) What kind of supervisors do we want to develop, or what are the specifications of the good supervisor?
(2) Who should be trained, or how shall we select the men whom we will develop as supervisors?
(3) What training should be given, or what training is required?
(4) How can the training be provided?

The mechanization of our mines demands a higher degree of technical training for those who aspire to the more responsible positions. In the past many supervisors have acquired necessary technical training through evening classes and correspondence courses. This same effort must be put forth for even limited advancement in the years ahead. It is a question whether or not, this training will be adequate for future needs in the top levels of supervision. The amount of such training required may make this task insurmountable except for the most able and ambitious.

To insure technically trained men for the higher supervisory positions, it appears that management must plan to develop graduate engineers through the supervisory ranks. Most graduate engineers lack the necessary practical work experience. This must be secured on the job. Through a wide variety of job experience the trainee engineer can become familiar with all phases of mine work. He will learn how to do the jobs which later he expects to supervise. After he has acquired this experience and secured proper certification as a mine official, he can begin his management experience as a first-line supervisor. He should receive the same training in supervision as is provided for other supervisors. He is in direct competition with all other supervisors and wins advancement through merit.

The question you may ask is—"What type of training should I give?" The answer is found in your own organization. Wherein is your supervisory organization weak? Is it in (1) knowledge of the job, (2) in planning, (3) in training workers, (4) in leadership or (5) in meeting the responsibilities of the supervisory job? To accurately spot your difficulties you may wish to take an inventory of your supervisory personnel. You may call it merit rating. Its chief value to you is to show where the personnel needs strengthening. From it you will be able to judge the kind of training that should be given and the method to use.

If we select the right men for supervisors, if we analyze our training needs, if we provide adequate training, and if our supervisors are properly coached by their superiors, we may expect that many of our supervisory problems will be corrected.

Safety in Coal Mining

By James Hyslop,
Executive Vice-President,
Hanna Coal Company

NOTWITHSTANDING the fact that the accident rate in the United States coal mines has constantly been decreasing over the past 20 or more years, the rate is still sufficiently high to make our industry one of the most hazardous. During the past ten years the reduction has been progressing at an increasingly rapid rate. Nevertheless, more attention than ever is being focused on the number of men killed and injured in the mines. This is, of course, as it should be, and a more determined effort is being made by mine management to achieve the irreducible minimum in mine accidents.

In recognition of the need for reliable information regarding the actual causes of mine accidents, the American Mining Congress has taken a real interest in mine safety through its Safety Committee. This committee has, for several years, been studying accident causes and has been using this information in ways that seemed most likely to contribute something tangible toward accident prevention. This is not an official report on the work of that committee, but an effort to call to the attention of the industry some of the more obvious deductions that can be made from the information gathered.

Mine accidents fall into two general classifications, namely: (1) Ordinary accident involving one or a small number of men and, (2) Catastrophes, resulting in the death or injury of a greater number of men from explosions and mine fires. Accidents coming within the first classification represent more than 85 per cent of the total, and those in the second represent less than 15 per cent. It is well known that the best progress can be made in the reduction of ordinary accidents when the proper emphasis is placed upon the work attitude and work habits of the miner. Catastrophes, however, are liable to occur whenever conditions that will produce mine explosions or mine fires are allowed to exist. Management is responsible for the prevention or elimination of conditions that may produce mine disasters and it is my opinion that it needs to realize more clearly that mine disasters can be eliminated.

There is no mystery about the causes of disasters in American coal mines. A study of those which have occurred will snow, beyond any doubt, that practically all of them were caused by one or more of a small number of conditions. Furthermore, these conditions can be avoided and it is becoming increasingly obvious that management must equip itself with the information and determination that will enable it to stop explosions and disastrous mine fires. There are many mines in which such hazards have been, to all practical purposes, eliminated. They can and should be eliminated in every coal mine.

Inadequate mine ventilation causes more mine disasters than any other single condition. More fresh air is being delivered to the face today than ever before. However, there is still need for a greater realization of the vital importance of adequate positive ventilation which will make it impossible for explosive atmospheres to develop. Inadequate ventilation often results from a defective mining system. Regardless of the amount of mine-fan capacity provided, a mine cannot be adequately ventilated unless the mining system is so designed as to conduct the air to where it is needed. The importance of properly designed and constructed stoppings, doors, and other ventilation control facilities is so well known as to require no elaboration here.

The second prominent disaster hazard is the lack of effective rock dusting. We know positively that coal dust will not explode if the proper amount of rock dust is present. The third important cause of mine disasters is the failure to keep a mine free from accumulations of combustible material, such as loose coal, coal dust, paper, wood, and other debris. Rock dust will not be effective if it is sprinkled on large accumulations of pulverized coal. Some mines are kept free from such accumulations. Good housekeeping is good business. It should be enforced in every coal mine. Serious mine fires seldom, if ever, occur if the mine is kept clean. The fourth catastrophe hazard is the failure to avoid explosive atmospheres in worked-out areas. Effective sealing or ventilation of such areas can be accomplished.

I would like to take this opportunity to suggest that each Operators' Association should have its own Safety Advisory Committee, composed of practical hard-working mining men who will make it their business to assist mine management in its efforts to carry out its safety responsibilities. In Ohio we have such a committee and it has done an effective job in examining the inspection reports. Consultations with operators, State and Federal Departments, safety directors and others have produced practical results, and have helped make Ohio mines safer. It is my opinion that such self-policing efforts on the part of mine management will do much to win the confidence of everyone, including the general public, in the mine operators determination to make their mines as safe as they can possibly be made.

Attracting Young Men to Coal Mining

By K. L. Konnerth,
General Manager of Operations,
H. C. Frick Coke Co.

Mr. Konnerth's paper appeared in full in the May issue of MINING CONGRESS JOURNAL.

What is New in Coal Preparation Methods and Equipment

By **Henry O. Erb**
Coal Preparation Consultant

THE days of loading run-of-mine or lump, egg, nut, and slack are over. Markets are demanding many sizes and definite qualities of coal that must be prepared in plants of the best engineering design. Coal preparation has become an art and the progress made in the past 25 years has really been amazing. Mechanical loading has made it necessary to clean coal mechanically and today we are mining seams that, without keenly engineered plants, could not be marketed profitably.

Higher quality and *consistent* quality are now most essential; a variation in quality in a steam plant or home causes no end of trouble. The ever-increasing demand for stoker coals has also added greatly to preparation processes. Elaborate crushing and screening facilities have had to be built. Flow sheets have become quite complicated. A tipple or cleaning plant is now a "factory" making "tailormade" coals.

Coals for metallurgical purposes are also becoming more scarce and preparation plants, to prepare coals for this demand, are being constructed.

Efficiencies have improved, maintenance costs and loss of operating time reduced with improved designs and experience. More knowledge of the limitations of equipment has also been helpful. Constant improvements are being made in equipment.

The paper then described in detail various processes and equipment including the Baum type jigs, the Belknap coal washer, the three-product Chance cone that has just been developed, Heavy Media Separation processes, including the pilot plant of the Pittsburgh Coal Co. and the new plant of Jones and Laughlin Steel Corp. now under construction. A combination dry and wet cleaning plant of the Island Creek Coal Co. was described in detail and the paper then outlined several processes of coal drying and water classification. It concluded as follows:

Sales forces are demanding up-to-date information on the qualities of the coals they have for sale. A producer must know what this product is. This means constant checking of products. Through the ASTM we have a set of standards for running all coal analyses. Some of these seem unwieldy for prompt results as well as expensive. One item for instance, is moisture determination. A committee has now been appointed to report on the use of the "Brabender" in which a number of moistures can be determined in about 15 or 20 minutes. This equipment has been used by some companies for several years and found reliable by their chemists. I believe ASTM, in cooperation with the Bureau of Mines, should work up a standard of test procedures for rapid checking of washing results, something that will be uniform and not too complicated.

A committee is now working to develop standard laboratory procedures for float-and-sink testing of coal and it is hoped that they will standardize the method of presenting the results.

In connection with oil treatment of coal, something new is being announced where high viscosity oils are required. This consists of a unit to keep the oil warm in the storage tanks and is also used for heating the oil in the tank cars for unloading. This arrangement heats and circulates hot oil and is completely automatic in operation. It eliminates the need for steam. There have been many improvements in accessory equipment for coal preparation plants such as pumps, vibrating screens, etc., that are too numerous to discuss at this time.

The coal mining industry is fortunate in having progressive equipment manufacturers who are always striving to develop something new, with the cooperation of the industry, to improve the quality of our products in the face of the keen competition of other fuels; thanks to the free enterprise system of this country that encourages the development of ideas without hindrance.

Refuse Disposal From Cleaner Plants and Breakers

By **Frank J. Meyer**, Division Engineer
The Philadelphia and Reading Coal and Iron Co.

THE methods of handling and disposal of refuse from the breakers of The Philadelphia and Reading Coal and Iron Co., situated in the Western Middle and Southern anthracite fields, is one of the major problems of operation, on account of the quantity and type of material involved and the topographic conditions in the vicinity of the plants. The feed to these plants is the product of mines and strippings from the heavy pitching beds of coal prevalent in these fields, where all material, including the extraneous material adjacent to the bed, must, of necessity, be loaded from gravity chutes into the mine cars or excavated by stripping equipment and transported by various methods to the plants. Consequently, these plants are obliged to handle a relatively high percentage of refuse from a given amount of cleaner plant and breaker feed. During 1947, the total refuse handled at the operations of the company was in the ratio of one ton of refuse for each ton of marketable product.

It is the purpose of this paper to describe the kinds of refuse, methods of disposal, quantities handled and equipment used at typical primary cleaning plants and breakers. The straight mine rock; rock removed by hand picking in the primary cleaning plants; rock and laminated coal rejects removed in the breaker preparation process compose the bulk of material to be handled and disposed of to the refuse bank areas and is referred to as "refuse" in this paper. Refuse is handled on the surface by many types of equipment. In some instances, the waste is hauled directly from the breaker to the disposal areas; in others, it must be transported from the breakers to hoppers on the bank and from these hoppers to the dumping sites on the disposal areas. The commonest types of equipment used are mine cars, refuse cars, refuse trains, flight conveyors, gasoline or Diesel-driven trucks, belt stackers, incline cars and belt conveyors.

In nearly all instances, the feed to these breakers is known as "rough-cleaned coal," as waste material is removed by a preliminary cleaning in the primary cleaner plants located advantageously near the mouth of the mine or stripping pit. In these primary cleaning plants, the straight mine rock, that is, the rock excavated in driving tunnels, rock gangways and rock holes in the mine, is dumped direct and by-passes the rolls and

Sources Tributary To	Quantity of Refuse Handled Expressed as Percentage of Raw Material by Weight				
	Straight Rock	Refuse in Coal			
		Removed at Primary Cleaning Plants	Removed at Breaker	Total Refuse in Coal	Total Refuse Handled on Surface
St. Nicholas	3.7%	12.3%	26.4%	38.7%	42.4%
Locust Summit	4.4	9.3	22.8	32.1	36.5
Oak Hill	1.9	8.3	40.6	48.9	50.8

picking tables and flows by gravity to the refuse hoppers. The other run-of-the-mine or stripping product is dumped on a feed shaker, equipped for the most part with screen plates having 5-in. round perforations. All material larger than this size passes to a picking table where the rock and other refuse is removed by hand picking. The coal passes over this table into rolls where it is reduced to smaller size and this product combined with the underflow of the shaker. The product is then known as "rough-cleaned coal" and is either loaded into railroad cars or onto belt conveyors for transportation to the central breakers.

Three typical cleaning plants of the company—the St. Nicholas central breaker, the Locust Summit central breaker, and the Oak Hill breaker (as described in detail in the paper) handle the quantities of refuse as shown in the accompanying table.

Disposal of Mine Waste and Washer Rejects

By **Stephen Krickovic,**
Chief Engineer
Eastern Gas & Fuel Associates

IT IS cheaper to mine all at the face and separate the pay material from the waste in the cleaning plant than to mine selectively. That has been in recent years and is now the thinking, the decision and the experience of an appreciable number of bituminous coal companies contemplating and operating new cleaning plants or major revisions of old ones. The impact of this statement can be readily appreciated with the knowledge that many new plant designs are based on 25 per cent to 40 per cent rejects. In one case, to my knowledge, the average yearly waste to the disposal dump is 38 per cent of run-of-mine material which means that, at times, the facilities were subjected to a load of 50 per cent rejects. As a matter of fact, one company is having a plant designed for just that high reject percentage. This is astounding when compared to mining even ten short years ago, and justifies the now common reference to mining as a materials handling job.

Therefore, one is compelled to conclude that selection of a type of mine rock and washer refuse disposal must receive the most careful and accurate analysis from the standpoint of need, adaptability, initial cost, operating and maintenance costs, dependability, and necessary provision for relief in an emergency. It is an obvious fact that inadequacies in the handling of rejects result directly in lower production and higher costs, as witnessed at so many operations where run of face mining preceded necessary tipple and cleaning plant changes.

There are many methods of transporting rock and refuse from the cleaning plant to the dump, and they can all be classified basically as follows:

(1) Aerial Tram
(2) Truck
(3) Larry or Monitor
(4) Belt
(5) Pump

The paper then discussed the first three methods, giving examples of actual installations and explaining the basic features of each, reasons for their selection over other methods and some general comments on each, concluding as follows:

When considering the over-all problem of rock and refuse disposal, it must be said that no system can be declared definitely superior for a certain job without careful analysis of all factors applicable to it. The system is like a tailor-made suit, in some respects. What is most economical at one location may not be at another. Certainly no other system would be as satisfactory and economical as the aerial tramway described in this paper. Also, I believe it can be stated with equal certainty that no other scheme would surpass the trucking arrangement also described here as the first two examples.

After determining the tonnage of rock and refuse to be handled and the disposal site or sites for same, the system selected will in general depend upon,

(1) Hourly capacities and life of property
(2) Topography of ground in vicinity of cleaning plant and location of dump areas

One should hesitate on tramways for spans of 4000 ft or more and for slopes in excess of 35 deg. In such cases the system must be designed as a special project which could easily result in high cost.

It is likewise true, if good roadways cannot be maintained practically and if the travel distances are excessive, trucking will be seriously handicapped.

(3) Advisability of handling washer refuse and mine rock at different locations
(4) Possibility of dumps washing into valleys where plant and town are located, and of the dumps shifting or slumping
(5) Desirability of preventing burning dump fumes from reaching the mining town
(6) Initial cost
(7) Availability of money
(8) Total yearly charges

A rock and refuse disposal system for present day and future higher tonnages must be adequate, dependable, and economical and to accomplish these aims a careful engineering analysis must be made of all factors involved.

Refuse Disposal From Cleaning Plants—Mid-West Methods

By **John R. Wilson,**
Preparation Manager
Union Colliery Co.

MUCH of the coal in this section is of somewhat higher ash than in other areas and the cleaning plants here have more refuse to dispose of. It is not at all uncommon for cleaning plants in the West Kentucky field to reject 25 per cent of the run-of-mine feed in order to deliver a product having the desired ash content. This necessitates a removal system capable of handling a tonnage equal to one-third the day's production of clean coal. Since truck haulage is mostly commonly employed throughout this section, it means that the operator must maintain a fleet having one-fourth the capacity of his run-of-mine haulage system. He must also build and maintain haulageways for the trucks and set aside a surface area of sufficient size to accommodate all refuse produced during the life of the mine.

Many operators, particularly those engaged in stripping operations, utilize much of their cleaning plant refuse for building haulage roads, thereby, in effect reducing the net cost of disposal. This is not always practical since the impurities in the seam are likely to contain high percentages of fireclay or clay-like material which disintegrates readily when wet. Obviously a refuse which turns to mud during a heavy rain is of no value as road ballast, nor can it be spoiled to any great depth where it is necessary to operate trucks in the spoilage area. If the cleaning plant is of the wet-washer type, this material goes into suspension in the wash water and so increases the amount of sludge to be wasted from the plant. If we consider the sludge as refuse, as is most generally the case, then the cost of the additional settling area must be charged to refuse disposal.

The mining method employed has a decided influence on the disposal of refuse. Full-seam, mechanical mining and strip mining, both common in the Midwest, result in increased tonnages of extraneous material, since the economy of both systems is at least partially reliant on the

cleaning plant's ability to dispose of the undesirable material. This means that the cleaning plant must incorporate a disposal system capable of handling not only all of the refuse inherent in the seam, but also the variations in the amount of refuse resulting from mining conditions, therefore, the disposal system must be set up for maximum tonnages expected, but must not be so elaborate or complex that it becomes an excessive expense during periods of minimum rejection.

The third factor which helps govern refuse disposal methods, topography of the area in which the mine is located, is the compensating factor in the case of Midwestern cleaning plants having high percentages of refuse. Most of our mines are in flat or slightly rolling country and can take advantage of flexible methods like truck or tractor haulage, thus permitting the use of alternate spoilage areas in the case of inclement weather or other unusual operating difficulties. This type of haulage also allows the refuse to be disposed of at considerable distances from the cleaning plant with only a slight increase in disposal cost, the attendant benefits being a more sightly plant area and less danger of corruption of the fresh water supply.

The abundance of space available in the vicinity of most of our cleaning plants allows us to store water during the wet months sufficient to see us through the drouth periods and so, in some plants, all of the refuse is crushed to such size that it may be pumped to the disposal area without regard for the water wasted in the process. Because of the flat topography of the Mid-west, refuse pile fires do not constitute the danger that is common in the Eastern fields, nor is the stream pollution problem so critical here.

We have all been prone to accept cleaning plant refuse as an unavoidable by-product of the beneficiation process and have hastened to dispose of it by the most convenient means available. The engineers who design our plants have been content to consider their job done when they have taken this material to the plant wall. Actually, refuse disposal is just as integral a part of the cleaning operation as is any other facet of the preparation picture and a breakdown in the disposal circuit is just as crippling as a breakdown within the plant proper.

To give credit where due, there has been considerable work done recently toward recovery of the marketable fines now being wasted as sludge. But we still lack an efficient method for cleaning fines smaller than 48 mesh, nor is there a dryer now on the market which is capable of economically reducing these recovered fines to a salable degree of dryness. The coarser refuse, aside from its occasional use as road-building material, represents a dead loss both as material and in terms of operating dollars expended. It is not logical that we should stand by and watch a sizable percentage of our run-of-mine product go into a spoil pile without making an effort to realize some return on this lost productive effort. These past 50 years have shown steady advancement in mining and preparation methods; virtually none in methods of refuse disposal.

What Will the Industry Do About Fine Coal?

By J. W. Woomer,
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Mr. Woomer's paper will appear in full in the July issue of Mining Congress Journal.

Increasing the Utilization of Coal

By John I. Yellott,
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MAJOR increases in our fuel requirements are inevitable, as a brief consideration of the principal energy consumers will demonstrate. There is no simple and easy way by which we can meet those rising demands, but it is certain that the need for coal will increase rapidly during the coming decade. The first factor which makes this increase inevitable is the deficiency of fluid fuels.

We are in an expanding phase of our national economic life, and industrial activity of every type is increasing. Our population is growing, and new housing must be provided. These new demands cannot be met by oil or gas, and they must be satisfied by and with coal.

A second factor which cannot be overlooked is the need for exporting a substantial amount of coal under the Marshall Plan. Western Europe cannot recover its economic self-sufficiency without coal, and this coal must come from American mines. The proposed shipments for the coming 12 months will exceed 40,000,000 tons—about 6 per cent of our annual output. How long these shipments will continue is a matter for the future to decide, but it is certain that American coal will be one of the most potent barriers erected against the sweep of the Red tide over western Europe.

A third factor is one which also did not exist before World War II. It is the interchangeability, from a chemical point of view of coal, oil and gas. We live today in the molecular rather than the atomic age, for our existence is dependent upon a wide variety of molecules of carbon, hydrogen, and oxygen—hydrocarbon compounds which range from fuels to foods and fabrics.

So similar are these materials in their fundamental nature that the organic chemist can synthesize virtually any of them, if only he has adequate supplies of the three essential elements—carbon, hydrogen and oxygen. In the past, the cheapest way to obtain liquid and gaseous hydrocarbons was to extract them from petroleum and natural gas. In the future, we shall have to turn to other more abundant but less convenient sources to obtain the necessary atomic building blocks: Air and water for oxygen and hydrogen; coal, oil shale, and tar sands for the carbon. We need never lack the fluid fuels, if we remain wealthy enough to afford them, for we have inexhaustible reserves of their components. The cost of replacing the natural with the synthetic, however, will be tremendous, in billions of dollars, millions of tons of steel, and uncounted man-years of technical effort.

These vitally important new developments in the competition among the fuels may be summarized by a simple statement: In this era of expanding demand, the United States and the rest of the world as well must look to coal as the primary reservoir of energy for power generation, and to carbon for synthesis. The justification of this statement lies in the magnitude of our fuel resources. At the present rates of consumption, the life of our reserves of gas and oil is expressed in decades, while our coal reserves are counted in tens of centuries. There are undoubtedly great reserves of oil and natural gas yet to be discovered, but the cost and difficulty of finding them are mounting so fast that even the most optimistic oil men acknowledge the necessity of looking to the relatively untapped fields of the Middle East as the only way of overcoming the deficit, which, within the next three years, will exceed 2,000,000 bbl daily of crude oil. The danger to our national welfare of relying upon a source of oil which can be delivered only through a 1000-mile pipeline and a 4000-mile ocean journey is so evident that no further comment is required.

We must, as a nation, regain the self-sufficiency in fuel which was one of our greatest assets in the past two wars. This means that we must utilize coal for every possible fuel requirement.

Those who seek to build industrial plants within the next five years will find that they must turn to coal for most of their fuel needs, for the oil industry

cannot supply them, and, in most of the industrial sections of the country, the gas industry cannot guarantee continuity of service during severe winter weather. Whether they want to or not, industries, laundries, stores, apartment houses, multiple dwelling groups, and similar consumers will have to rely upon coal, and here again there are two problems. The first is the equipment which is available; the second is the quality of the fuel which will be supplied for use in that equipment.

The coal-fired gas turbine will have a wide field of use in stationary plants as well as in locomotives. The gas turbine is the first power plant which can exceed 25 per cent in thermal efficiency without using a drop of water. An immediate application will be in supplying power for coal mines, which now must purchase power because they have no water for boilers or condensers. The gas turbine will free the power engineer from bondage to the boiler, and it will enable him to locate his power plant where he wants it, rather than where nature caused the river to flow or the lake to gather.

The increasing electric load is going to be met almost entirely from coal-burning equipment, because most of the hydroelectric sites have already been exploited, and no other realistic possiblities exist for the generation of large quantities of power. Atomic energy is still far in the future, and meanwhile the nation's peak load is increasing at the rate of 3,000,000 kw per year. In the year 1947 all previous records for consumption of electricity were shattered—255,700,000,000 kwhr were used, as compared to the previous maximum of 228,200,000,000 in the peak war year, 1944.

The preceding paragraphs have endeavored to present an analysis of the factors which will affect coal demand in the near future. It is apparent that our expanding economy will demand more energy, and that increase must come from coal. Better coal-burning equipment and more carefully prepared coal will retain for the coal industry, in spite of any unlikely future abundance of oil and gas, the customers who will have to turn to coal because no other adequate source of fuel exists.

Synthetic Oil From Coal

By **Charles E. Hemminger,**
Senior Engineering Associate
Standard Oil Development Co.

THE conversion of coal to oil and gas is now receiving renewed attention from the oil and coal industries and the Government because of the tremendous increase in the consumption of natural gas and petroleum products since World War II. Our peace and wartime economies require large volumes of liquid fuels as a result of the increased use of internal combustion engines as prime movers for all forms of transportation ranging from airplanes to diesel locomotives and ships. However, it is expected that the oil industry can and will meet the future expanding demand through the installation of crude oil producing and refining facilities and through the installation of synthetic oil capacity when economical. Another phase of the oil supply problem is the provision of sufficient fuel for military use in case of national emergency.

Laboratory and engineering studies which have been undertaken for the purpose of evaluating the position of other sources of petroleum products than crude oil, should be of interest to the coal industry. Since coal is not the only alternate source, this paper will discuss the domestic crude oil reserves and production of gasoline from natural gas and shale, as well as from coal, as a generalized background to the very large and complicated problem.

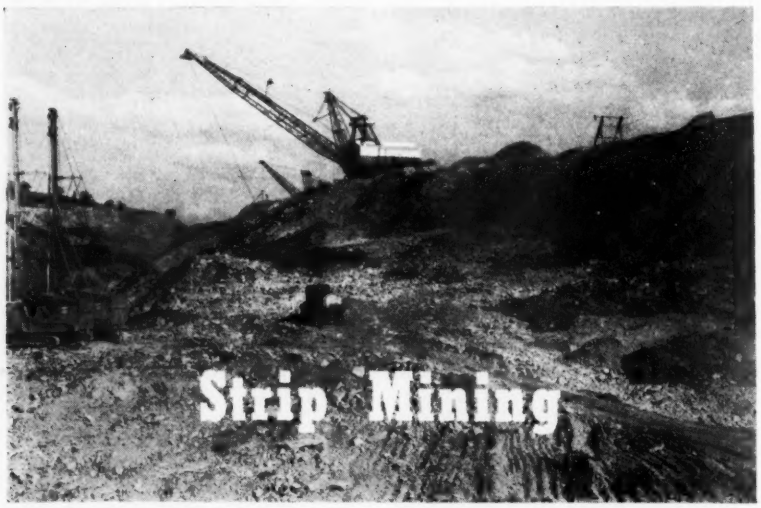
The use of energy from all sources has increased at a rapid rate in recent years. In 1941 it was 27 per cent greater than in 1920 and in 1946, 47 per cent greater than in 1920. The energy derived from crude oil increased 300 per cent from 1920 to 1941 and 400 per cent from 1920 to 1946. At the same time the energy from coal decreased about 12 per cent.

Anticipating that this steady increase in demand for liquid fuels will continue in the future, research on new and improved methods of producing them from sources other than crude oil, such as from natural gas, coal, and oil shales, has become a major project in the oil industry. The Bureau of Mines is also carrying out a program of research and development along similar lines.

The magnitude of the effort directed to synthetic fuels may be measured in part from research expenditures. The original $30,000,000 program of the Bureau of Mines has recently been expanded to $60,000,000 by Congress. They are investigating coal hydrogenation, Fischer-Tropsch synthesis, and oil shale mining and processing. Affiliated organizations of the Standard Oil Co. (N. J.) have been highly active in this field for many years. Some 20 years ago they started a $10,000,000 development program on hydrogenation of oil and coal culminating in the erection of several large oil hydrogenation plants which operated for a number of years. They played an appreciable part in processing of aviation gasoline in World War II. Later, work was started on development of the hydrocarbon synthesis process as an improvement of the older German Fischer-Tropsch process for making gasoline from natural gas and coal, but this research was discontinued during the war years. In 1945 the development of the hydrocarbon synthesis process was resumed and up to the present time about $10,000,000 has been expended on the problem. Vigorous research programs on synthetic fuels have also been carried out by other oil companies. It is estimated that during the last year the oil industry spent in excess of $10,000,000 on research to provide liquid fuels from non-petroleum sources.

Approximate figures now available indicate that the cost of producing gasoline from natural gas compares favorably with the cost of gasoline from crude oil. As indicated by the construction of two commercial plants, the development of this process is nearing completion. As a large portion of a coal to oil process, the successful operation of these projects will speed the development of the coal plant. It appears that the investment and steel requirements for the conversion of coal to gasoline by hydrocarbon synthesis are in the same order of magnitude as those for producing gasoline from crude oil in case the present designs are substantiated by pilot plant work. Any additional improvements due to the operation of these pilot plants and increased difficulty in finding and producing crude oil will be favorable to the gasoline from coal projects. The new and novel process for gasifying coal to synthesis gas, which is to be tested at Library, Pa., will be of considerable interest to the coal industry, not only because it will be of use in industries which may use raw gas for fuel purposes, but because it may open the door to a new and large market for coal. Then, the coal production curve may be influenced by the same growth factors that have increased the use of petroleum products during the past decades.

Well-attended sessions signalized the deep interest in the Convention proceedings.



Progress in Strip-Mine Haulage

By **A. E. Coddington,** Civil Engineer
Carey, Baxter & Kennedy, Inc.

THE purpose of this discussion is to review briefly the development of strip-mine haulage of overburden in the anthracite region of Pennsylvania, to describe conditions and practices in this region, and to discuss general requirements and future trends, truck haulage, and haulage with self-loading scrapers and tractors.

It is hardly necessary to discuss the importance of strip mining to the well-being of the anthracite industry. It will simply be pointed out that in 1947 a total of approximately 16,000,000 tons of anthracite were recovered by stripping operations throughout the region, or about 33 per cent of the entire production. In order to maintain this percentage, and thus assure a favorable balance with the higher cost of underground mining, coal companies are planning progressively larger, deeper, and higher ratio projects as the lower ratio strippings become depleted. For example, the Philadelphia & Reading Coal & Iron Company's Shenandoah stripping will be nearly 3000 ft wide at its widest point and over 300 ft deep at its maximum, while the Lehigh Navigation Coal Company's Greenwood 40-ft mammoth stripping will be about 1600 ft wide and over 500 ft deep, extending down below the third level of the surrounding mine workings. It is obvious that with these combinations of width and depth, even the largest draglines are not adaptable and some form of haulage must be employed for most, if not all, of the overburden removal. This type of operation is not a "stripping" as ordinarily thought of, but an open-pit mine.

Hauling overburden, as a means of uncovering coal, has been going on in the anthracite region for over 60 years, and as in most other regions where large open pits have been excavated, locomotives and cars were one of the early types of equipment used. The crude narrow-gauge, side-dump cars of small capacity have developed into standard-gauge, air-operated dumpers of capacities up to 30 cu yds. Equipment of this type was in use for strip-mine haulage in the field as recently as five years ago. Its disadvantages for this type of work are well known, the main ones being lack of flexibility for negotiating grades and curves necessary for deep pits and those of limited area, and the increased cost of laying, maintaining and shifting track in the face of greatly increased labor costs.

One of the earliest attempts to overcome these disadvantages was the introduction of shovel-loaded wagons mounted on crawler tracks and pulled by tractors. These units were used on a job at Archbald, Pa., in 1929, by Robert Michaels, and a number of other contractors followed suit, using three-way dumpers with down-folding sides, and gasoline-powered tractors. They had the advantage of extreme flexibility of operation and ability to maintain a good dump at low cost and to negotiate poor roads in all kinds of weather.

Their disadvantages were slow speed, making them inefficient for hauls in excess of 500 or 600 ft and prohibitive repair costs due to constant wear and excessive vibration. A variation of this unit came in the early 1930's with the introduction of "bath-tub" bodies without side or tail gates. With these wagons also came the first Diesel-powered tractors. It was about this time that trucks were first used for hauling overburden and their use gradually widened until by 1935 a number of types and sizes were in service, meeting with varying degrees of success. Bull-dog Macks and Sterlings, both chain driven, and with sturdier transmissions, had an advantage over most of the others on the poor roads to be found in most strippings at that time. Capacities ranged up to 5 cu yds, and practically all were gasoline powered. At this point, manufacturers began to see the possibilites in the field, and to design for the particular requirements of the service, which are most exacting. For a discussion of present practices, let us look at a few open-pit operations in detail as to the haulage characteristics and repair and maintenance facilities. It so happens that most of the large operations involving haulage of overburden are located in the western middle and southern fields of the region, and for this reason, three large jobs in these fields are selected for discussion. Practices in the eastern middle and northern fields, however, will not vary widely from those described.

The paper then described in detail the practices at the Locust Gap operation of Philadelphia and Reading Coal and Iron Co., the Shen-Penn Production Co. operation at Shenandoah, Pa., and the Greenwood stripping of Lehigh Navigation Coal Co. at Tamaqua, Pa.

Dragline Versus Shovel in Deep Overburden

By **O. E. May,** Superintendent
Northern Illinois Coal Corp.

ORIGINALLY I was asked to prepare a paper on the subject, "Dragline versus Shovel in Deep Overburden," but later a request came through asking that it not be made controversial. Versus means controversial in my dictionary and further, the subject is controversial in that it could be stated shovel and dragline versus deep overburden. Nothing in the subject matter seems compatible, for I believe young men entering the stripping industry today will be using different machines and different methods, if they end their working years stripping coal.

Deep overburden is a hard term to define in that what may be deep overburden in one locality will not be deep overburden in another. This is true because of the thickness of coal, the nearness of markets, or other reasons which make it possible to strip deeper overburden in one place or closes the mine down in lighter cover in another field. For the purpose of this discussion let us keep in mind the ratio of cubic yards of earth to the recoverable tons of coal. When this ratio becomes so large that we can no longer compete in the mining of coal, we have indeed found deep overburden, whether it be 55 ft or 80 ft of cover.

The modern shovel alone is not a tool for deep overburden because it reaches its limit of overburden generally before it reaches its economic limit. If we had large reserves of low-cover coal little would be said or done about any other machine or method for stripping. The shovel is limited in range and to effectively increase its range we must

decrease the size of the bucket and the production yardage of the machine. This we cannot afford to do. It is conceivable that we may continue to increase the size and range of this machine, by the use of light structural metals or other means, however, there has been no recent major move in this direction.

Since the shovel is a short-range economic machine we have, for a long time, been working them in combination with other machines of less economic operation, principally smaller draglines. This has not been the best operation but has been necessary because of overburden too deep for the shovel to handle alone, and all operators would rather not do this if it could be prevented.

By present standards the shovel is an effective machine in earth moving and in order to maintain efficiency when working it in combination with another machine, the other machine has to be more economical than the shovel or the over all efficiency of the operation is reduced. Working machines in combination, even of like efficiency, will reduce the over all economy of stripping within a pit and should not be practiced except when necessary. This being true and since the shovel of necessity must move the short-ranged earth, we return to the problem of another machine to move more earth, farther, at less unit cost if we want to maintain the efficiency of the combination to that of the shovel and not increase our stripping costs. Should we ever get such a machine, we had better use it for the entire bank for the best results.

The dragline as discussed here is a fairly recent development of an old machine. There was a time when stripping men thought that the best way to go broke was to use draglines. This theory has been disproved. The modern dragline is as efficient as the modern shovel and has the added advantage of more range. It is partially taking care of the problem of stripping deep overburden in that it is moving about the same amount of earth, farther, at about the same cost as a shovel. This is in no way the answer to the stripping of deep overburden for in our field we can move 55 ft of cover efficiently with our shovel and we expect to move only 70 ft of cover efficiently with the draglines; in other words, we have increased our present efficient stripping depth by only 15 ft of cover.

These draglines are worked on a prepared bench made anywhere from the top of the highwall to 20 ft below the surface. In rough terrain and low cover, fills must be made from which to travel and work the machines. In working below the surface, the bench cut is kept one cut ahead of the coal cut. This procedure allows the machine to work closer to the spoil, giving more reach by eliminating the slope on the top 20 ft of cut and offers better material from which to travel and work the machine.

The paper then gave a complete discussion with numerous illustrations, of the various factors involved in surface blasting, as well as methods of determining their effect and concluding with the following summary:

Time does not permit going into the method for evaluating damage levels. Briefly, if we are going to damage a thing we must exert enough force to accomplish the damage. Plaster, being the most brittle structural member of a building—affords a good criteria for evaluating damage. The Bureau of Mines made a special study of the force required to break plaster and found that the physical displacement was of the order of 0.050 in. before caution should be exercised and that it requires about 0.100 in. to produce breakage. From the records you have seen today—the vibration generated forces seldom exceed 0.020 in.—and if they do—it's good business on your part to make changes in your operating methods to keep within these limits—otherwise you can expect to live with a lot of complaint.

Broken windows are frequently charged to blast-produced vibration. Tests have shown that pressures necessary to break glass must be in the neighborhood of 2 psi. Pressures of this kind do not exist more than 30 to 50 ft from a confined explosion.

Foundation damage is next on the common complaint list. It has been demonstrated time and time again that earth-borne vibration energy is not sufficient to cause foundation cracks. If we go into the history of unconfined explosions during the past 50 years in all parts of the world—and incidentally, the data gathered by this history formed the basis for compiling the American Table of Distances for the storage of explosives which has been incorporated into law by many states—we find that it takes 16,000 lb of explosive to do damage to foundations, walls and roofs at 1000 ft.

It is frequently suggested that when a building is continually subjected to vibrations from blasting, damage will result. This is known as the theory of elastic fatigue. If you were blasting every minute of the day, week in, and week out, elastic fatigue would occur in something like 1000 years. This theory simply does not apply to quarry or mining operations.

In concluding my remarks—I have attempted to crowd the results obtained in 15 years of investigations into 30 minutes. I have covered the high points. You have seen how the blast energy moves away from the blast point in the form of waves, the nature and action of the different waves, and the fundamentals of instruments for the measurement of this wave motion. I have shown you a practical method by which the migrations of these waves can be determined, and the results obtained by actual survey. I might leave you with a few DON'TS:

DON'T underestimate the value of measured seismograph data.

DON'T rely upon human reactions to measure vibration. The human body is the poorest registrar there is.

DON'T put off obtaining this information until you are faced with a lawsuit.

Hillside Stripping in West Virginia

By Harold L. Bailey,
Bailey Construction Corp.

Mr. Bailey's paper will appear in full in the July issue of Mining Congress Journal.

Earth Vibrations From Heavy Blasting

By Jules E. Jenkins,
Vibration Measurement Engineers

PROBLEMS associated with earth vibrations caused by heavy blasting operations usually start with claims for damage to some nearby private property. These problems are by no means new, but the topic is of timely interest to those of you who are engaged in strip-mining operations. Many of you are aware, no doubt, that blasting vibration problems have engaged the prime attention of the quarry industry for the past 15 years. The seismological investigations which were sponsored by them make it possible for me to come before you today with a set of proven facts concerning the behavior of what takes place in ground near heavy blasting. In this respect, you are fortunate. The quarrying industries had to find out for themselves. Today, the results of their research are available to you.

Blasting vibrations have their social side. For the most part, this is classified under the heading of common gossip. There are a number of cases on record which have been terminated only after costly litigation, the starting point of which was gossip. These tales have a habit of "snowballing"; they grow with the telling. When they reach the courts, they take on the aspect of a crusade; hysteria creeps in. When this happens the problem often gets far afield. Seismologists know that the human reaction to blast produced vibrations is psychological rather than seismological. A number of progressive dynamite users treat this as a matter of public relations, and by widespread publicity, and public education campaigns, have effectively combatted gossip.

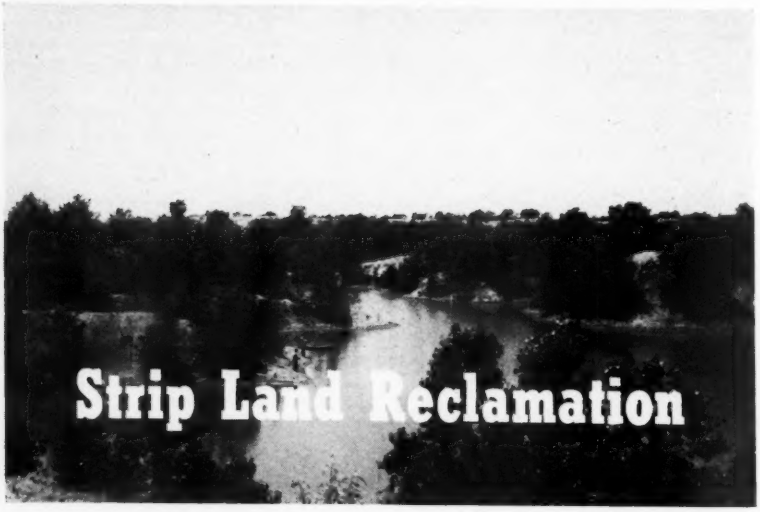
What is this thing we call vibration? What do we mean when we say that an object vibrates? Vibration is one of the most common of our every-day experiences. Airborne, it conveys sound to our ears. Through the earth, or other materials with which we are constantly in contact, it comes to us in the form of elastic vibrations. These result from such ordinary events as walking across the floor, opening and closing doors, the passing of trains, trucks and other street traffic, the operation of machinery, almost everything that moves—and dynamite blasts.

We can get a better understanding of the action of surface waves if we visualize a cork bobbing in water and observe its motion at a given point. We would find that its movement is upward and forward, then downward and backward. Now, if we exchange the cork for an earth particle, and observe the action of such a particle in the path of an elastic earth wave, we have a method by which to describe each of the several types of waves which transmit energy through and along the surface of the earth to produce the motion we call elastic vibrations.

Strip Mine Truck Haulage

By Lester E. Briscoe,
Electrical Engineer,
Ayrshire Collieries Corp.

Mr. Briscoe's paper appeared in full in the April issue of Mining Congress Journal.



Strip Land Reclamation

"Open-Pit" Mining Legislation

By **R. T. Laing,** Executive Secretary
Mineral Producers Association

IN the recovery of coal by open-pit mining methods, the surface and contour of the land is disturbed. The cover, or overburden is removed and cast aside, forming spoil banks. These banks became prominent in the landscape and created a picture unpleasant to the aesthetically minded. The land economist, together with the aesthetically-minded and conservation-minded groups, viewed this condition with alarm, became quite hysterical, and petitioned law-making bodies for statutes to regulate the industry. As a result of this public concern, the legislatures of the states of Indiana, West Virginia, Maryland, Ohio, Pennsylvania, and Illinois enacted legislation regulating the industry. The Supreme Court of Illinois held the statute in that state unconstitutional, although in Pennsylvania the higher court upheld the action of the legislature.

The various legislation that has been enacted follows a rather definite pattern in that the chief objective is the reclamation of disturbed lands. Various degrees of reclamation are required in the individual laws. Some require merely the knocking off of the tops and ridges, and others require the return of the land to a semblance of its original contour. They all require that the land must be planted in trees, shrubs, or grasses. They also require registration by the operator and the filing of a bond to assure the performance required by the act.

The mining of coal by the open-pit method on a large scale is comparatively new. It was given its greatest impetus during the recent war when victory, to a great extent, depended upon energy that could be supplied only by coal and its derivatives. Since it takes considerable time to develop a deep mine for quantity production, and time was certainly a factor in this crisis, open-pit mines which require little time for development multiplied rapidly. In a great many instances the new pits were developed by persons unfamiliar with the coal industry. Little thought was given to geological conditions and in a great many instances prospecting for coal was done with a bulldozer or power shovel. As a result of this careless hit-and-miss experimenting, the terrain in many localities in the coal fields was spotted with abandoned pits. These spots, often located on or near main highways, aroused the interest of the public who, because of lack of knowledge and facts, reacted negatively to the cause of the open-pit mining industry, and began agitation for government regulations of the industry.

The industry is acquainted with such agitation and the legitimate operator is concerned; in many states associations of operators and others connected with the industry have been formed. The first objective of such association is survival of the industry. These associations have not followed a definite pattern but each has as one of its objectives the reclamation of disturbed areas. Some associations have voluntarily accepted the responsibility of reclamation and other states have accepted legislation that is reasonable and just. There have been instances where it was necessary for the industry to oppose legislation that was punitive and unjust.

Conditions in the various states in which open-pit mining is conducted vary greatly. No two states have the same problems from a terrain or reclamation standpoint. In some states the industry is concentrated within narrow limits and confined to a few operations. In other states—Pennsylvania, for example—there are in excess of 500 operators stripping coal in 22 counties.

We in the open-pit mining industry know that the great majority of lands disturbed by open-pit mining are non-productive, sub-marginal, and waste lands. We also know that the revenue derived from the coal removed from these lands has been instrumental in paying off mortgages, paying back taxes, and improving the land in general. We know that the removal of coal by the open-pit mine method is a conservation measure. We have discovered, also by experimentation on the part of experts, that this land can be given utility and that a wide program of reclamation, voluntary or compulsory, will result in a valuable heritage to posterity. Common sense must be the rule. If the industry, of its own free will, will not take the responsibility of reclaiming and giving utility to the disturbed lands, then we cannot be too critical of sane legislation imposed by law-making bodies.

In 1947, 135,000,000 tons, or approximately 22 per cent of the nation's coal supply was produced by the open-pit method. There is no immediate indication that the industry has reached its peak—the development of more efficient equipment and the extension of the coal market will give added impetus to this type of mining. If we are to survive we must adopt a program of reasonableness in reclamation and convince the public in general that we are not bandits and rogues but a legitimate part of the economy of the nation. We must show this people that our program of reclamation, required or voluntary, will bring favorable results to posterity.

Land Reclamation By Forestation

By **L. E. Sawyer,**
Indiana Coal Producers Association

THE reclamation of land from which the coal has been removed by open-cut mining has been a problem of open-cut mine operators since the industry was in its infancy. The records of early attempts at reclamation are either non-existent or are extremely sketchy. We in Indiana are fortunate in having a fairly complete record of the reclamation program since its start. That was in 1918 when the Rowland Power Co. planted an area of spoil piles to a mixture of peach and pear trees. The remnants of this original planting still exist in Clay County, Ind. History shows that for a period of years both the peaches and pears thrived and bore profusely. Then, because of the absence of spraying and other cultural treatment which they must have, most of the peach trees died. Seedlings of those original trees are still growing in that area and are yielding crops of fruit. The original pear trees still stand, and each year several carloads of pears are produced by them.

The first actual harvest of timber from mined-out land in Indiana was made in 1946 when the state of Indiana harvested pulpwood from the Greene-Sullivan State Forest. The Greene-Sullivan State Forest land was mined in 1928 by the Central Indiana Coal Co. In the 18 years between the time of mining and 1946, that area produced cottonwood trees as much as 16 in. in diameter. Thousands of other acres of mined-out lands in Indiana and other states are duplicating that performance.

The materials thrown up in the spoil piles present a problem entirely different than the problems which have been studied in the past by state and agricultural

experiment stations and soils departments. The material is different from from natural soil found anywhere in the mining territory or in the world. Once mining has been completed there are no definite soil horizons and it therefore cannot be associated with any soils group or series. For that reason the species of trees which may grow and thrive on undisturbed land in that same territory may behave entirely different wheu planted on mined-out land. For example, cottonwood, sycamore, and river birch species, which are normally found in wet overflow bottom lands, not only grow in large numbers in the mined-out areas, but thrive even on the tops of the ridges. Jack pine, native to the sand plains of the Lake States, thrives and reproduces itself at an extremely early age. The fact that some species used in the original plantings failed completely while others thrived is of great value to us in planting programs. We are using that information as our guide, for adequate research work has not been done to give us any better basis upon which to develop our programs.

Multiple Uses of Stripped Areas

By **Orel E. John, Farm Manager**
Reclamation Development Co.

RECLAIMING of mined areas where coal is mined by the open-pit method, is gaining momentum much more rapidly over the past two or three years. There has been some work of this kind, however, for about 30 years or since stripping coal was first started. Since trees, shrubs, grasses, and legumes grow exceptionally well on a majority of the spoil banks, it should follow that wild life of all kinds would likewise thrive in such surroundings.

The state of Illinois alone has over 2,500 acres of strip-pit lakes, and Ohio, Indiana, Missouri, Kansas, Oklahoma, and the rest have thousands of acres of fine water that is being used for recreational purposes.

Fish do remarkably well in these waters and many of the state departments of wild-life conservation are becoming more and more interested in their values. Tests are being run on the effects of pit water on the growth, reproduction and development of fish; these tests are favorable and there seems to be no doubt that the fish do better, grow much more rapidly, and are delicious for food. This is true, we think, due to the much greater supply of new minerals and plant foods that are found in the water that leaches out of the soil that has been brought up from the stripping operations. Much of the land on the surface has been depleted of the plant food and essential minerals and will not support wild life. Much of this can be found deeper in the earth than is worked for farming but unless there is deep digging, such as is done in stripping operations, it is lost.

Hunting and trapping is another important phase of the stripping industry. Literally thousands of hunting enthusiasts are seeking new game areas and stripped coal fields lend themselves beautifully for wild fowl, fur bearers, and other forms of wild life. Byron Sommers of Canton, Ill., had a total of $600 worth of furs caught off his pit lakes in the trapping season of 1946-47, one half of which paid for all taxes on the land.

Ducks and geese by the thousands use these waters in their annual fall and spring migrations. They are used for feeding and resting places and as protection from storms. With a little management, these places can add much enjoyment to the hunters. By seeding wild rice, smart weeds, wild millet, and other desirable food and cover their value increases by leaps and bounds.

Quail, dove, prairie chicken, and song birds of many kinds are using these spoil banks. Beaver, muskrat, mink, raccoon, rabbit, fox, and all local wild animals are found in strip-pit lakes and spoil banks.

We find that fruits that are adapted to local conditions will do much better on the spoil banks than on the original land before it was mined. Peaches and berries of practically all kinds, grapes, etc., grow fine. The resulting fruits are second to none in size, flavor, and food elements. Honey bees find this a sweet paradise with the fruits and sweet clovers that grow here. Many bee growers are anxious to have the chance to place their colonies of bees in these areas. Honey is getting to be one of the valuable by-products of coal stripping.

The public is beginning to realize the values that are possible in the strip-mined areas and are wanting to purchase them, publicly or privately. I urge you to find out more about the possibilities that present themselves, with little effort, in these coal-stripped fields.

Land Reclamation of Illinois Coal Strippers

By **J. W. Bristow, Secretary-Treasurer**
Illinois Coal Strippers Association

THE reclamation of land overturned by stripping shovels is now a general practice of Illinois coal strippers. There was little concerted effort along this line in Illinois prior to 1937, largely because the attention of our operators was directed toward the development of more economical mining methods, the perfection of preparation processes, the development of permanent markets for their products, and the acquisition of coal reserves with which to supply them.

A large-scale attack on the problem was launched in 1938. At that time foresters and agronomists could supply no information whatever on the subject of plant species that might be successfully grown on recently exposed soils that had lain far below land surfaces through geologic ages. There were no sign points pointing the way to profitable uses for such soils except large areas naturally revegetated by wind-borne seeds of trees and grasses and two small forestry projects not sufficiently advanced to throw a great deal of light on the subject. However, starting with these indicators, a rehabilitation program was inaugurated, under which, as of April, 1947, forestry, stock range, and horticultural projects had been initiated on 23,437 acres of mined-over land. In the present year an additional 1988 acres were either forested or sowed with forage grasses, bringing the over-all area upon which reclamation work has been initiated or completed up to 25,425 acres.

Up to this time 11,400,000 forest tree seedlings of some 35 different species and varieties have been planted on 10,725 acres of spoil banks in Illinois. A majority of these plants have been successful, and where the species of trees selected were adaptable to the soil composition of the planting sites, survival and growth rates have outstripped that of similar species planted on undisturbed lands.

The conversion of spoil banks into stock range was pioneered in Illinois. This form of land use has proved in some cases to be so successful that many operators have turned almost exclusively to sowing forage grasses on their mined areas. As of the spring of 1947, more than 13,000 acres had been seeded with grasses and legumes.

The annual returns from about 4000 acres of this land, some of which has been in pasture since 1938, have not only long since repaid all costs of development, but are continuing to make annual returns much higher than average Illinois pasture lands. The carrying capacity of spoil-bank stock ranges and the phenomenal growth and rapid gain of cattle, sheep, and hogs ranged on them are difficult for agronomists and stock men to believe.

Since 1942, one large company with extensive operations in the southern Illinois fruit belt has been engaged in exploring the possibilities of developing spoil-bank orchards and vineyards. The results have been so encouraging that the experiment now extends over 75 acres of mined and unmined land on which more than 100 varieties of fruits, grapes, nuts, and berries were planted. Plans for utilizing a considerable additional spoil-bank acreage for fruit production are now under development.

On some of the orchard sites the banks have been practically leveled; on others only the peaks have been struck off. The degree of strike-off most economical and satisfactory for orchard development has not yet been determined.

These developments are the result of private initiative and a free hand in exploring methods of land use not covered by existing sciences of forestry, agronomy, horticulture, or ecology. They demonstrate the futility of state laws, however well intentioned, which now require various amounts of spoil bank grading work followed by tree or grass planting in line with the academic practices recommended for undisturbed top soils. Too often such laws stifle the incentive and imagination of operators to the point where they are content to merely comply with the minimum of statute requirements rather than explore the possibilities of more profitable land uses. Under free enterprise, Illinois operators have progressed further along the road to profitable and diversified reclamation of spoil banks than any other state in which coal stripping is a factor in the coal industry, and in following this line have made progress in public education to the value of mined land, as well as great strides in reclamation technique.

The National Scope of Reclamation

By **Thomas C. Cheasley,**
Sinclair Coal Co.

A NUMBER of organizations interested in reclamation with working representatives forming the Land Use Advisory Committee include the Mineral Producers Association of Pennsylvania represented by Bob Laing, the Ohio Reclamation Association represented by Larry Cook, the Department of Forestry and Reclamation of Ohio with L. E. Sawyer, and the Illinois Coal Strippers Association with J. W. Bristow and Lou Weber taking care of their interests. In Missouri we have the Missouri Coal Operators Association, of which I am secretary, and also the Reclamation Development Company, represented by Orel John. Kansas and Oklahoma have the Southwestern Interstate Coal Operators Association and, the baby of the reclamation group, the Kentucky Reclamation Association. This has been organized since the first of the year, and is now functioning with Jim Moore as field director. They were fortunate in getting about 100,000 seedlings planted this spring. However, due to the lateness of the season, we are not too sure what the result will be.

I mention all of this to show you how the groups composed of your strip-mining companies function as a unit through the Land Use Committee and the Land Use Advisory Committee, to get the job done on a national basis. The committees were formed with the object of helping one another, and I am speaking now of the help we can give each other in the matter of actual reclamation in the field; I know that all the groups in the organization can and will give assistance as and when needed. The trips made by the members of the Committee in the different reclamation areas have been the source of a lot of information on areas many of us knew nothing about.

Most of us are opposed to the word "leveling" in connection with the reclamation of strip banks. We feel it is the worst thing that can be done; that the porous bed thrown up by the shovel or dragline gives rain and snow a chance to penetrate instead of rushing away to the creeks; it gives the air a chance to penetrate to the roots and gives the roots a chance to spread rapidly. The porosity of the root bed or seed bed is probably the chief reason why we have the growth of so many species that are not expected to survive in contiguous so-called agricultural land.

The other reason, perhaps, is that "deep plowing" brings up the minerals, the chemicals, and the nutritional elements that are missing in the top soil; and with the combination of the moisture in the porous bed with these chemicals and minerals we are, perhaps, more fortunate than we know. Perhaps we can develop, as we go along, some information that will surprise Dr. Chapman and many others who are interested in this program.

Dr. Chapman and his field organization in the Central States Forest Experiment Station of U. S. Forest Service have done a remarkable job and given wholehearted cooperation to us. Men like these give us new hope in the belief that governmental agencies can spend tax money wisely.

Reforestation to Furnish Mine Timber

By **Larry Cook,**
Executive Vice President,
Ohio Reclamation Association

WE of the Land Use Committee are prone to address our remarks directly to those engaged in the production of coal by the strip-mining method, but I feel that the benefits to be derived from this program will be much more far-reaching. Of course, one of the immediately recognizable benefits is the removal of the stigma which has arisen out of the disturbance of surface areas due to the method of mining. Since it is a truism that anything which has an adverse effect upon the public regarding any part of an industry, has an adverse effect upon the public regarding the whole industry, it is therefore, for the general welfare of coal mining that strip operators have found an answer to a problem which has taken on public significance.

There is a more tangible benefit, however, from these discoveries, and one which, although applicable to practically every industry to a greater or lesser degree, should hold a particular significance to those engaged in deep or underground mining operations. Although I am not going to present an array of statistics to prove this significance, I would like to make use of a few figures to illustrate my point.

Back in 1945 we became acutely aware in Ohio of the cost of timber used in deep-mine coal operations. It came to our attention that, from a cost of production standpoint, timber had become a major factor in getting the coal out of the ground. Realizing the need for a greater knowledge of this factor, the Ohio Coal Association sponsored the Forest Resources Appraisal Board of the American Forestry Association in a special study of Ohio's timber supply with relation to coal mining, to be made by John Tillinghast, regional consultant for the Board. Later that same year, when this study had gotten underway, I asked the management of one deep mine producing 9000 tons of raw coal a day to keep a record of their timber costs for 1946. The tabulation began on January 1, 1946, but March and April were excluded because of the strike during those months, and I did not receive the figure for December. Nevertheless, the figures for the nine months of 1946 showed the cost of timber delivered at the mine entry for this one operation amounted to $265,950. Although that figure is completely outdated now, it serves to give some idea of the importance of the cost of timber used in deep mining operations.

In the spring of 1947 Mr. Tillinghast made a report of his study. Taking an average year, his report showed that better than three fbm were used for every ton of coal mined and that 0.89 fbm was high quality, saw material requiring at least 50 years for growth.

Although this is one item picked from the report to illustrate the point that I am attempting to make, it clearly signifies the importance of timber to the deep-mine operator. Over the coal fields there is a tremendous variance in the timber requirements of the different mining operations and it would be presumptuous to attempt to make these figures applicable to all. It would be more than presumptuous to attempt to tell you what the timber situation is in a particular operation, but I can say that many operators have recently become aware of the importance of making an individual study of their timber requirements, and many have been astounded at what these studies revealed.

Cattle grazing on reclaimed stripped land.

Personals

H. A. Reid, vice-president in charge of operations for the United Electric Coal Cos., recently announced that effective May 1, 1948, **Gene H. Utterback** was appointed chief engineer.

Mr. Utterback spent eight years as assistant engineer of construction and maintenance with the Big Four Railroad and in 1930 became associated with the Enos Coal Mining Co. as construction and production engineer. In 1944 he became technical advisor to the British Ministry of fuel power for strip coal mining in England. From 1945 to the present time he was general superintendent for the Saxton Coal Corp. Mr. Utterback will be located in the Chicago office of the United Electric Coal Cos.

Frank H. Buchella, for 10 years assistant general manager of Chino Mines Division, Kennecott Copper Corp., at Hurley, N. M., is now associated with the Magma Copper Co., which is developing the San Manuel copper mines in Arizona.

P. F. Herrly, president and director of the Pittsburgh & Ashland Coal & Dock Co., has announced his resignation after 31 years of continuous service. Mr. Herrly has organized a new selling company for marketing dock and all-rail coals, lignite, and chemicals. The new firm is known as the Herrly Fuel & Chemical Co. and is located at 1302 Foshay Tower, Minneapolis, Minn.

Dr. L. L. Sloss, until recently professor of geology at Montana School of Mines and geologist on the staff of the State Bureau of Mines and Geology, was honored with the "President's Award," at the annual meeting of the American Association of Petroleum Geologists at Denver.

Fred G. Koper, Harry J. Evans and **P. H. G. Brabant**, of Pierce Management, left on May 3 for China to start initial work on design and construction of four new coal mines to produce 10,000 tons of coal daily.

J. W. Woomer and **John T. Boyd**, of Pierce Management, left on May 1 for Mexico to plan the expansion of two coal mines at Palau and Sauceda for the Government of Mexico.

Thomas Jancic, former night foreman at the Cole shaft of the Copper Queen Branch, Phelps Dodge Corp., Bisbee, Ariz., has been appointed superintendent of the corporation's Burro Mountain Branch, Tyrone, N. M. He succeeds **E. H. Metz**, temporary agent, who has been transferred to the Copper Queen Branch. Jancic has been with Phelps Dodge at Bisbee since 1940, except for the year he spent in active service during the World War as a member of the engineering corps of the Army.

John J. Forbes has been named to succeed Dan Harrington, who retired April 30 as chief of the health and safety division, U. S. Bureau of Mines.

Mr. Forbes has been assistant chief of the division since July 1945, and has been in immediate charge of the coal mining inspection branch since its inception in 1941, except for a period of special duty during the war.

During World War II, as chief of the mineral production safety division, he directed work to help safeguard mines, smelters, and processing facilities from sabotage and accidents that might cause production losses. He is an expert in mine rescue and rehabilitation and has taken part in investigational and recovery work at some of the nation's worst mine disasters.

John M. Bush, manager of the land and lumbering department of the Cleveland-Cliffs Iron Co., has resigned after 48 years of service with the company in the upper Michigan ore fields.

Arthur J. Ericson, who has been with the company since 1904, succeeds Mr. Bush as manager of the department.

John Stephenson has been promoted to superintendent of the Warwick mine of the Duquesne Light Co.

H. DeWitt Smith, vice-president of the Newmont Mining Corp., has been elected a member of the board of directors of the St. Joseph Lead Co.

George E. Sokolsky, columnist and recipient of an honorary doctorate from the University of Notre Dame in 1946, was the guest speaker and received an honorary doctorate of laws from the Montana School of Mines at the 1948 commencement on May 28.

Grover Robertson has been appointed assistant manager to the Winding Gulf Collieries Co., which operates mines in West Virginia.

Harold A. Linke, for many years construction supervisor at the Arthur plant of Kennecott Copper Corp., is establishing a general engineering practice with offices in the Dooly Building at Salt Lake City.

J. C. Helvy recently resigned his position as superintendent of the Minden mine of the New River & Pocahontas Consolidated Coal Co.

Norman Sather has been appointed superintendent of mills of the Hecla Mining Co., succeeding W. L. Zeigler, who has been assigned to the management of the Pend Oreille Mines & Metals Co. at Metaline Falls, Wash. In this new position Mr. Sather will be in charge of work at the Hecla, Star, and Polaris mills and the Osburn tailings plant.

George S. Jaxon, after 33 years of active service with the Link-Belt Co., is planning to retire on July 1. Mr. Jaxon has been active in promoting the more efficient operation of coal for many years and his retirement will be a distinct loss to that phase of coal mining.

With the retirement of **Irwin H. Cornell**, vice-president and sales manager of St. Joseph Lead Co., **Charles R. Ince** has been appointed to succeed him. Mr. Cornell has been with St. Joseph Lead since 1910 in various capacities and will remain as a member of the board of trustees of the executive committee.

Mr. Ince has been with the company since 1929 as assistant to Mr. Cornell. As his assistants in this new position he will have **Malcolm Bonynge** and **Dwight Marshall.**

Luis G. Jordan, Jr., is chief engineer of the Rail and River Coal Co. He succeeds A. F. Whitt who recently resigned.

Harrison Schmitt, mining geologist, of Silver City, N. M., recently announced that he will be able to give part of his time to private consulting practice, specializing in examination and appraisal of mineral deposits, geological mapping and research, and the planning and direction of exploration for mineral deposits.

According to a recent report, **Louis Gaggini** has been appointed chief engineer of the Sheridan-Wyoming Coal Co., Inc.

George C. Bartholomees has completed his work in French Morocco and returned to Bonne Terre, Mo., where he is mining engineer for the St. Joseph Lead Co.

James M. Riley, Sr., after more than 50 years of service with the Tennessee Coal, Iron & Railroad Co., has retired from active duty. Mr. Riley is the second of four generations employed by the company.

Dr. **H. C. Mowery** has succeeded P. E. Jacobs as president of the Coeur d'Alene Mines Corp.

John H. East, Jr., senior mining engineer for the U. S. Bureau of Mines, has been transferred from Washington, D. C., to the Denver office.

George J. Clark has been promoted to the position of president of the Shen-Penn Production Co., a subsidiary of the Philadelphia & Reading Coal & Iron Co. Mr. Clark was formerly chief engineer of the Shen-Penn Co., and on his new post succeeds **Edward G. Fox,** who has become general manager of the parent company. **Charles E. Brown** has been appointed as stripping engineer by the Philadelphia & Reading Coal & Iron Co. **John F. McCall** has been made Pottsville Division engineer, a post formerly filled by **Elmer F. Young,** who has been promoted to mining engineer by P & R. **Elmer S. Christ** is superintendent of the Locust Summit Division succeeding **Fred C. Caldwell,** who has retired. **Emil R. Ermert** has been named chief engineer of the Shen-Penn Production Co., succeeding Mr. Clark. **Clyde H. Stephens** has been named vice president in charge of sales for P & R. **John Kopfinger,** formerly at Locust Gap, has been named superintendent of the Locust Gap Colliery, succeeding **D. L. Freiler,** who has been transferred to the Oak Hill Colliery as superintendent. **Ray Minnich** has been promoted to foreman at Locust Gap.

Wilbur F. Crisswell, Helena, Mont., has been elected chief engineer of Porter Bros. Corp., succeeding **Gailen T. Vandel,** who is vice-president and general manager of the Jardine Mining Co.

— *Obituaries* —

William B. Daly, 75, retired manager of mines of the Anaconda Copper Mining Co., died May 1, after a long illness.

Mr. Daly retired from his position as manager of mines for the Anaconda company on January 1, 1940. He was recognized throughout the world as an authority on mining methods and cost accounting and was especially active in the development of safety methods, in mining ventilation, and continually exerted his efforts to improve the working conditions of mine labor.

He was born January 4, 1873, in Smartsville, Calif., and attended primary schools in his home town and studied law and began practice in 1894.

When he came to Butte in 1899 he was attracted to the mining industry and started in on his new profession as a mucker, later serving three years as a practical miner. In turn he became a surface foreman, bookkeeper, and then secretary to the late J. P. O'Neill, superintendent of the Anaconda-Never Sweat group of mines.

His exceptional capacities for responsibility received recognition and he progressed rapidly to positions of increasing importance in the company. In 1924, on the retirement of John Gillie as manager of mines, he was named to that post, the highest technical post in the Anaconda company's technical organization.

The entire mining industry will mourn the loss of this highly respected and deeply loved eminent member of the profession.

George Martinson, one of the members of the Mining Section of the National Safety Council, died in March after more than three decades of splendid service in forwarding the interest of safety in the Lake Superior mining region. Mr. Martinson was foremost among those who formulated, placed in effect, and kept in operation the policies and procedures that produced and maintained the outstanding safety results for which the mines of the region are noted.

Harrison Claire Henrie, general superintendent of the Copper Queen Branch, Phelps Dodge Corp., Bisbee, Ariz., died on April 23. Death resulted from acute coronary thrombosis after a hospitalization of ten days.

Born at Shamokin, Pa., in 1885, Mr. Henrie was graduated from the Pennsylvania State College with a degree in mining engineering. He went to work as a mucker in the Lowell Shaft of the old Copper Queen Consolidated Mining Co. on April 1, 1908, and continued his connection with the property when it was acquired by Phelps Dodge Corp. In 1935 he was named assistant general superintendent, and on January 1, 1938, assumed his duties as general superintendent, Copper Queen Branch.

Mr. Henrie was a nationally recognized authority on industrial safety practices and a specialist in labor relations.

Charles J. Heidenreich, discoverer and locator of the Richmond and Monitor copper mines and long active in mining in the Coeur d'Alene district, died on March 31, 1948. At the time of his death Mr. Heidenreich was a director on the board of the Clayton Silver Mines and was the principal owner in the Ajax Sand & Gravel Co. of Spokane.

Howell H. Fletcher, 62, general manager of mines for the Dickinson Fuel Co. and prominent in the coal industry, died in April after a three-week illness.

Mr. Fletcher was to have presented his paper, "Machine Cutting with Tungsten Carbide Bits," at the 1948 Coal Convention. His passing is a distinct loss to the industry as well as to his many friends.

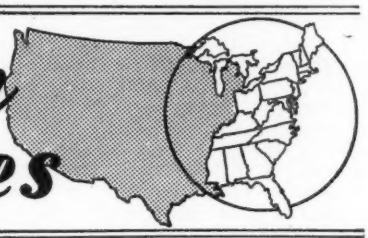
Harold S. Gay, American mining geologist and long a resident of Mexico, died after a short illness, on April 24, in Queretaro, Mexico. He was a graduate of Stanford University and for many years was employed as mining engineer and geologist by American Smelting & Refining Co. and Compania Minera Real del Monte.

Byron G. Best, supervisor of safety for the Oliver Iron Mining Co., passed away in Duluth on May 8. Since 1909, Mr. Best has been in service with the Oliver Iron Mining Co. on the Gogebic iron range.

Leonard C. David, assistant manager of Pickands Mather & Co. in Duluth, died in Cleveland on May 7. Mr. David first joined the Pickands Mather firm in 1918 as assistant general superintendent of the eastern Mesabi district.

NEWS and VIEWS

Eastern States



Mine Power Cable Discussed at Kentucky Meeting

On May 10 the regular meeting of the Eastern Kentucky Electrical and Mechanical Institute was held at Pikeville, Ky., with many mining men and manufacturers' representatives attending. J. C. Calvert of the General Electric Co. presented a paper on "Cable for use in Open Pit and Deep Mine Service." Considerable progress has been made in determining the best cables for mining as a result of problems encountered during the war and immediately after.

New officers of the Institute were elected as follows: George Leatherman, Inland Steel Co., president; Hugh Ferguson, Sr., Kentland Elkhorn Mining Co., first vice-president; Walter M. Crase, Princess-Elkhorn Coal Co., second vice-president; and Lee D. Siniff, Consolidation Coal Co. (Ky.) secretary and treasurer.

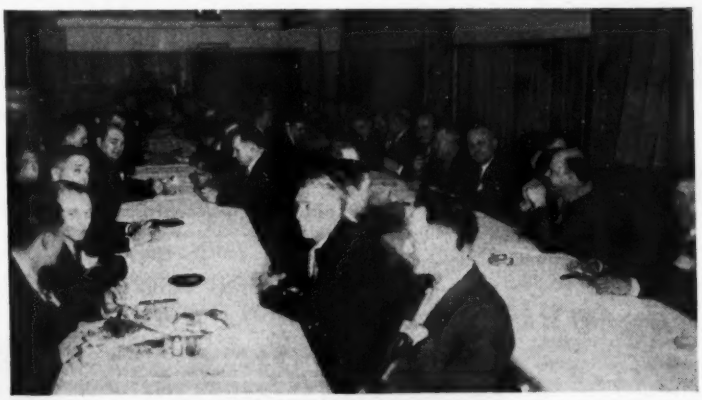
Synthetic Liquid Fuels Laboratories and Pilot Plants Dedicated

On May 21 the new synthetic liquid fuel laboratories and pilot plants of the Bureau of Mines, located at Bruceton, Pa., were dedicated. Dr. James Boyd, director, U. S. Bureau of Mines, was master of ceremonies at this important occasion, at which Joseph C. O'Mahoney, U. S. Senator from Wyoming, and J. A. Krug, Secretary of the Interior, spoke before those privileged to attend.

Three main buildings house the bulk of the equipment in use at Bruceton. A central administration building houses the administrative staff, a cafeteria, machine and instrument shops, a drafting room, a warehouse or stockroom area, and various service shops.

The largest of the three structures is a three-story coal-hydrogenation building for investigations of the Bergius process, which can produce liquid fuels ranging from high-octane aviation gasoline to Bunker "C" fuel oils for ships and industrial use. At the rear of the laboratories is a gas plant which provides hydrogen for coal-hydrogenation and a mixture of hydrogen and carbon monoxide for gas synthesis work.

The laboratories lie adjacent to the Baltimore & Ohio Railroad line which carries coal to the boiler plant. The coal is divided into two streams, one destined for steam purposes and the other for processing into liquid fuels. Modern equipment for drying, crushing, and cleaning coal is provided, and preparation practices are under study to permit the use of a wider range of coals for synthetic fuels.



Kentucky Institute meeting.

Alabama Coal Mine Opened

The Brilliant Coal Co. opened its new Brilliant West Clifty Mine at Brilliant, Marion Co., Ala., about April 1. The new mine began production at 400 tons per day from the Black Creek seam with mechanical equipment. It is expected that the mine will produce 600 tons per day by April 1950. W. J. Hinz is superintendent of the new property and George Mann is assistant superintendent. Charles Berryhill is the mine electrician.

Jewell Ridge Begins Production

The new drift mine of the Jewell Ridge Coal Corp. in Buchanan Co., Va., began production in April and plans call for expansion of current production to 1000 tons per day. M. C. Thompson is superintendent of the new mine and Mark Smith is general foreman.

Mining Interests Urged to Investigate Adirondacks Iron Deposits

In a recent announcement, Harold Keller, Commissioner of the N. Y. State Department of Commerce, urged 23 of the nation's leading iron and steel manufacturing firms, with extensive mining interests, to investigate two new deposits of iron ore explored recently in the Adirondacks. Maps of the area explored have been prepared by the New York State Science Service and, together with descriptions of the deposits will be available shortly. Two seasons of field work have provided sufficient data for the preparation of detailed magnetic maps of the deposits which are located near Santa Clara in Franklin County, N. Y.

Kentucky Mine Rescue Association Meets

On May 6 at Middlesboro, Ky., the first general meeting of the Kentucky Mine Rescue Association, Post No. 2, National Mine Rescue Association, was held. Discussions on explosions in small mines in Kentucky and Virginia, on sealing and recovery of a mine following a fire, and on recovery of bodies of men asphyxiated were led by Aubin Higgins of the West Kentucky Coal Co., Eddie McGaw and Frank Forsyth of the Kentucky Department of Mines and Minerals, Eddie Rowe of the Republic Steel Co., W. H. Tomlinson and M. L. Davis of the U. S. Bureau of Mines, and A. D. Sisk of the Big Sandy-Elkhorn Coal Mining Institute.

About 100 members attended the meeting which was presided over by Arthur Bradbury of the Inland Steel Co.

Underground Power

About 200 were present at the 5th Annual Joint Meeting of the New River and Winding Gulf Electrical and Mechanical Institute with the American Institute of Electrical Engineers and the American Mining Congress Committee on Underground Power at a meeting held at Beckley, W. Va., on May 14. Speakers at this year's meeting were David E. Renshaw, who spoke on "Braking of Electric Mine Locomotives"; Warren J. Lewis, who delivered a paper on "Track—the Other Half of the Power Circuit"; and L. W. Roush, whose paper was concerned with "Vinylite and Polyethylene Cable Insulation."

Larry F. Livingston, representing the du Pont Co., displayed and described a large array of articles produced by industrial chemistry.

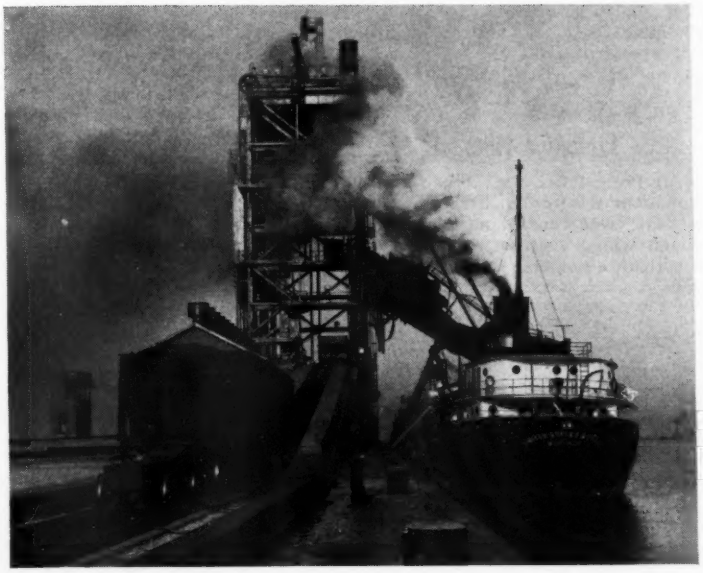
Joseph A. Holmes Safety Association Awards

Special honors were conferred upon 12 individuals who risked their lives to save others in the mineral and allied industries by the Joseph A. Holmes Safety Association. For outstanding safety performance records and exceptional success in supervisory work, the Association approved one special award and 21 Certificates of Honor for individual presentation, and 113 Certificates of Honor for presentation to 48 coal mines and mining companies, 28 metal mines and mining companies, 26 petroleum plants and companies, and 11 cement plants and quarries.

Chateaugay Exploration Reveals Additional Ore

Continuing exploration work at the Chateaugay mine of Republic Steel Co., located in the Lyon Mountain area in northern New York State, has uncovered substantial additional tonnages of high grade magnetite ore. Although the mine is primarily an underground operation it is expected that a portion of the newly-found reserves may be mined by open-pit methods.

B & O Opens New Coal Dock



AT a formal gathering on April 28 the Baltimore & Ohio Railroad opened its new $4,500,000 coal dock at Lorain, Ohio. The coal dumping device, which is completely electrically operated can dump 70-ton loaded coal cars at the rate of one per minute to complete the loading of lake vessels.

The new coal dock adjoins the older B & O ore dock at the mouth of the Black River. The complete facility now includes two piers, a rail yard with a capacity of 4000 cars, the coal-dumping machine and three ore unloading machines.

Coal handled at the new dock will come from the fields of West Virginia, Ohio, and western Pennsylvania to be transferred from hopper cars to lake vessels for movement to Canadian lake ports and the U. S. lake ports at the western extremities of the Great Lakes. Iron ores from the Lake Superior region will be trans-loaded from ship to train at Lorain for movement to the steel centers of the East. Remote control of all operations is handled by an operator located in a tower from which all equipment is readily seen. To assure efficiency of communication between the supervisor of the coal dumper, the tower operator and the operators in the electric pushers that move the cars up to the dumper ramp are equipped with two-way voice radio. Floodlight illumination permits 24-hour operations.

Island Creek Training Program

Island Creek Coal Co. and associated companies operating coal mines in Logan, Mingo, McDowell, and Wyoming Counties in southern West Virginia are expanding their operations substantially and are taking action to improve the supply of trained personnel.

Training programs have been devised for both undergraduates and graduate students to enable them to become better executives as they grow up with the company. Training programs for graduates provides a basic training plan including various working experience, regular courses in safety, supervision, labor relations and other pertinent mining subjects and discussion meetings with key executives on mining subjects.

Two year programs leading to positions as mining engineers and as mechanical and electrical engineers have been outlined. Assignment of trainees is under the direction of a management training coordinator who will be in constant touch with all men in the training program.

Bituminous Coal Research Holds Annual Meeting

The annual meeting of Bituminous Coal Research, Inc., was held on May 19, Columbus, Ohio. Dr. Frank B. Jewett, president of the National Academy of Sciences and former director of Bell Telephone Laboratories, spoke at a luncheon meeting. Other speakers included Dr. H. J. Rose, Elmer R. Kaiser, M. H. Forester, and John I. Yellott who presented a series of papers following the central theme of the convention, "A Year of Accomplishment."

Weirton Mine Has Fifty Year Life

Six miles south of Morgantown, W. Va., is the Weirton mine of the Weirton Steel Co. and National Steel Corp. More than $5,000,000 will go into the new mine and equipment to make it ready for annual production of 1,500,000 tons of metallurgical coal. A 10,000 acre tract of land is estimated to contain a sufficient tonnage of coal for 50 years of continuous operation.

One of the important features of the new mine will be a two-mile long tunnel which will run underground from the mine to the river docks on the Monongahela. It will contain the world's longest coal conveyor built.

Engineering Contest

A contest offering $100 cash prize reward for papers or articles of material benefit to the diamond core drilling and manufacturing industry is being sponsored by the Diamond Core Drill Manufacturers Association. Evan Just, editor, *Engineering and Mining Journal*, and Philip Buckey, head, Columbia School of Mines, Columbia University, have agreed to serve as judges of all entries submitted.

All employes on the payroll of any member of the Diamond Core Drill Manufacturers Association, excepting executive or managerial heads of concerns, are eligible to compete in the contest. Entries should be submitted to C. C. Rohrbach, secretary, Diamond Core Drill Manufacturers Association, 90 West Street, New York 6, N. Y. Complete details concerning the manner in which papers should be submitted may be obtained from Mr. Rohrbach. The prize will be awarded and the winning entry read at the annual meeting of the association.

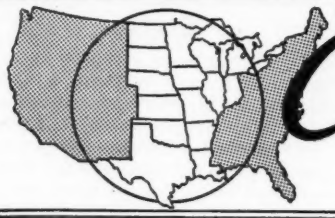
Mine Inspectors' Institute

Beginning on June 7, the Mine Inspectors' Institute of America held its 38th Annual Convention in The Neil House, Columbus, Ohio, discussing four major mine explosions at Exeter, Pa., West Frankfort, Ill., Terre Haute, Ind., and Excelsior, Ark., mine fires on conveyor belts, roof supports, changes in state mine laws, haulage accidents, voice communication through soil and strata and the rock-dusting problem consequent on continuous operation of mines.

The sessions were preceded by a buffet supper on June 6. A banquet with dance was held with R. L. Ireland, president, Hanna Coal Co., as toastmaster on Tuesday, June 8.

Exhibition Mine

Near Pocahontas, Va., is the famous Pocahontas Exhibition Mine which is the only coal mine in the world through which visitors may walk, or drive their automobiles to see nearly every step of modern coal mine operation. The original Pocahontas mine was opened in 1883 and in its 63 years of operation has produced more than 1,000,000,000 tons of bituminous coal. Estimated reserves total approximately 4,000,000,000 tons. Visitors may drive their cars through the mine and then park to take a leisurely walk and examine in detail the processes of mining employed in this modern operation. Since the Pocahontas Exhibition Mine opened in 1938 more than 600,000 visitors have taken advantage of this excellent opportunity to familiarize themselves with coal mining.



Central States

Mechanized Slope Mine

A completely mechanized slope mine is scheduled for opening in June by the Carmac Coal Co. at Carmac, Williamson Co., Ill. This completely mechanized operation will include a new tipple with a washery. Starting production is planned at 1000 tons per day, which the operators hope to raise to 2000 tons per day by fall. Charles W. Barker is superintendent of the new operation.

Management Changes at Old Ben Coal Corp.

Several staff changes were made by the Old Ben Coal Corp. in a recent announcement effective May 1, 1948. R. L. Adams was promoted to vice-president in charge of operations; Ernest E. Green is now assistant to the vice-president in charge of operations; Howard Lewis is general superintendent; and Ed R. Lutz is superintendent of plants. George A. Strunck holds the post of electrical engineer and Frank Eubanks is maintenance engineer.

Officers have been elected to the Old Ben Coal Corp. as follows: D. W. Buchanan, chairman of the board; George F. Campbell, president; D. W. Buchanan, Jr., vice-president; F. E. Homan, vice-president and secretary in charge of finance; and G. A. Grosser, treasurer.

American Zinc Institute Elects Officers

Howard I. Young, president of the American Mining Congress, president of the American Zinc, Lead & Smelting Co., has been reelected president of the American Zinc Institute to serve his fourteenth term, at the annual meeting of the Institute.

C. Merrill Chapin, Jr., of New York, representing the eastern states; O. W. Bilharz of Baxter Springs, Mo., representing the central region; and Russell B. Caples of Great Falls, Mont., representing the western area, were reelected vice-presidents of the American Zinc Institute.

Ernest V. Gent was elected to serve his fourteenth year as secretary and, in recognition of his services to the American Zinc Institute, was named to the new post of executive vice-president which was created by the newly elected board of directors. Raymond F. Orr of Fort Smith, Ark., was reelected treasurer.

Copper Range Reports Low-Grade Ore Body

Exploration and development work at the White Pine property of Copper Range Co. was carried on through July 1947, when exploration work was discontinued. A large, low-grade, copper-bearing ore body has been indicated.

Morris F. LaCroix, president, in his report covering 1947 operations, said that the White Pine ore body contains enough copper to make it one of the great potential sources of copper in this country.

The report revealed that since 1937 a total of 139 diamond drill holes have been put down on the property. Although final calculations of ore reserves have not been completed, preliminary estimates reviewed by Ira B. Joralemon indicate the following tonnages and copper content: 94.2 million tons of developed ore averaging 21.4 lb of copper a ton. Of this, 44,720,000 tons, averaging 26 per cent copper, are parting shale. In addition there were estimated to be 105,410,000 tons of probable ore, averaging 23 per cent copper. Of this latter total, 62,050,000 tons averaging 25.1 per cent copper were said to be parting shale. It was estimated further that the ore contains an average of 0.20 oz of silver per ton.

Kansas-Line Lease Producing

According to reports from W. T. Graham and E. M. Fournier, managers of the F. & G. Mining Co., operating on the old Kansas-Line lease, a mile northeast of Picher in Kansas, a good zinc and lead mine has been opened.

Mining operations are being carried on at a depth of 235 ft on a slightly pitching ore body which will eventually take workings down to the 275-ft level. The ore is being trucked to the Lucky Jenny mill of the Harris Mining Co. at Hockerville for treatment. The company plans to open the old Kansas-Line mill shaft and expand operations.

Organization Changes Made By American Zinc, Lead

American Zinc, Lead & Smelting Co. announced, effective April 20, the following organization changes:

William J. Matthews, Jr., has been promoted to the position of secretary and treasurer of the parent company and all of its subsidiaries. Clarence V. Burns has been promoted to the position of assistant secretary and assistant treasurer of the parent company and all of its subsidiaries. Rowland K. Wall and Ralph C. Perkins have been appointed to the positions of assistant secretaries of the parent company and all of its subsidiaries. Kenneth M. Hays has been promoted to the position of assistant treasurer of the parent company and all of its subsidiaries.

Large Tipple Serves Strip Mine

At Odessa, Jackson Co., Ill., the Admiral Coal Co., Inc., has opened a strip mine in the No. 6 seam. This new operation, which is expected to produce as much as 2500 tons per day by July 1948, is being served with a four-track tipple.

Anaconda Undertakes Exploration Campaign

F. W. Anderson of Salt Lake City, geologist in the exploration department of Anaconda Copper Mining Co., recently announced the inauguration of an extensive drilling and prospecting program for zinc-lead minerals in the southern section of Crawford and the northern section of Cherokee County in the southeastern part of Kansas. Anaconda has obtained the mineral rights—excepting coal, oil and gas—on some 50,000 acres of leased and fee land in this area. It is planned to drill a course of line holes to determine structural formations in the hope of finding similar structural features to those of the mineralized areas and ore-bearing horizons of the Tri-State district.

Three drill rigs are already at work and more will be added as the prospecting expands. Drilling will be done through the Cherokee shale into the Boone formation of the Mississippian horizon in anticipation of finding cherty conditions favorable to ore deposition at depths varying from 300 to 600 ft.

It has been reported that Victor Rakowsky, widely-known Joplin mining engineer, was instrumental in interesting Anaconda in the exploration program. Over a period of years he has conducted a geological and geophysical survey of the area in order to obtain adequate information to promote the structural drilling program.

W. L. Seymour of Salt Lake City will be in charge of the initial drilling program and will make his headquarters at Pittsburg, Kans.

Lead Mining Centennial in Missouri

This year is the 100th anniversary of lead mining in the Tri-State zinc-lead mining district which includes parts of Kansas, Missouri, and Oklahoma. In 1848, near Joplin, Mo., the first lead ore was discovered. Mining began in that year and was followed by discoveries of zinc ore in the adjoining states.

Eagle Picher and Northwest Lead Form New Firm

J. M. Bowlby, president of Eagle Picher Co., Cincinnati, and Roger H. Cutting, president of the Northwest Lead Co. of Seattle, recently announced the formation of the Associated Lead & Zinc Co., incorporated in the state of Washington. The new firm will engage principally in the manufacture of lead oxides and allied products. The operations of the Associated Lead & Zinc Co. will be separate and distinct from existing facilities of the two firms which formed the new organization.

Arkansas Bauxite

Results of a four-year project investigating Arkansas bauxite reserves are being published in a series of 18 volumes to be issued soon. The first three are now available. More than 12,000,000 tons of recoverable bauxite were added to the Arkansas reserves, which totaled nearly 40,000,000 tons in January 1946.

Copies of the first three volumes, R. I. 4251-53, inclusive, "Investigations of Arkansas Bauxite," may be obtained free of charge from the Bureau of Mines, Publications Section, 4800 Forbes Street, Pittsburgh 13, Pa.

Drifting Record on Keweenaw

An advance of 426 ft was made in March on the 24th level north drift on the Seneca No. 2 shaft of the Calumet & Hecla Co. This is a record for a five-day week, three shifts per day, on the Peninsula. The previous record of 471 ft on the Peninsula was made when the mine was working six days per week. Each shift was composed of a miner and a trammer at the time the record was made.

Coal and Cement

The coal shortage created by the miners' walkout caused the suspension of manufacturing operations by the Missouri Portland Cement Co. at its plant in St. Louis, Mo. The shutdown put 300 employes temporarily out of work, according to company officials. The plant consumes about 12 carloads of coal each day.

Lead Executive Expresses Views

At a Lions Club luncheon at the National Hotel, Flat River, Mo., on May 13, Andrew Fletcher, president, St. Joseph Lead Co., was called upon to answer a series of questions pertaining to lead, mining, and the policy of his company.

In answer to a question concerning the possibility of increases in the price of lead beyond 17½¢ per lb, Mr. Fletcher stated ". . . if the commodity index should continue to rise because of continued inflation, I would then expect an even higher price of lead."

In answer to one question, Mr. Fletcher stressed the importance of teaching the youth of our country the background of our country's history and why we have developed the highest standard of living in the world. Mr. Fletcher expressed his stand on the American way of life by saying "I have absolutely no use for planned economy, which is another word for socialism, because I feel that the freedoms which we enjoy in this country are interwoven with free markets and free enterprise."

He expressed the opinion, in answer to a question regarding the problem of increased wages and commodity price rises, that inflation is bound to result from the enormous losses in productive labor and the waste of natural resources and property caused by war and added that we should urge our representatives in Congress to try to keep the budget balanced, that money should not be spent foolishly, that the operating costs of local communities should be kept low as possible, production should be increased, and lower costs should be obtained by increased efficiency.

Towards the conclusion of the program Mr. Fletcher stated that the total annual payroll of the St. Joseph Lead Co. was approximately $17,000,000, of which about $12,000,000 was paid in that area. Three points were brought out emphasizing the partnership between employes and stockholders and the relation of both towards the community. Mr. Fletcher called attention to the following interesting points: "(1) The stockholder is back to 100 per cent and is receiving $3 per share as he did in 1925; (2) the cost of living has increased from 100 per cent to 133 per cent; (3) the average hourly earnings of our payroll employes has increased to approximately 265 per cent of the 1925 figure and is now about $1.66 per hour. A payroll employe now receives annual earnings at the rate of $3,424 per year, which is 220 per cent of what he received in 1925."

Mining Section of National Safety Council Holds Meeting

On March 19, 1948, a representative group of the Mining Section of the National Safety Council met in Chicago, Ill. The Engineering Committee outlined plans for publications on drilling, chute pulling, slushers, and haulage, and stated that a preliminary draft of the publication on drilling was partly completed. A publication on the operation of heavy-duty trucks for transporting ore, earth, and stone has already been completed. All members of the Mining Section were urged to send sketches or drawings of safety devices and information about other types of safety developments for distribution to the membership.

A recommendation was made by the Statistics Committee that future computations of the injury severity rate be calculated on the basis of 1,000,000 man-hours instead of 1000 and that the new rate should be designated as the "time charge rate." The Safety Committee emphasized the necessity for making operations safer throughout the entire metal mining industry.

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Fad Shaft Encounters Water

An unexpected flow of water encountered in the Fad shaft of the Eureka Corp., Ltd., at Eureka, Nev., broke the heavy, concrete door which had been installed as a precautionary measure on the sixth level at a depth of 2250 ft. The rate of inflow of water prior to the new influx was 1600 gpm but, when an estimated flow of 3500 gpm was encountered, the main pumping station was flooded and the shaft was filled to a point approximately 1400 ft from the surface.

The company ordered Diesel engines and pumps sufficient to handle 5500 gpm from the 2250-ft level and pumping operations began in May. An estimated six weeks will be required to pump the shaft free of water.

New Shaft Project Begun

Shortly after the announcement by the A. S. & R. Co. that it had started work on a new 2000-ft four-compartment shaft at its Ground Hog property at Vanadium, N. M., a similar announcement was made by the United States Smelting, Refining & Mining Co., that a contract had been awarded for a new deep shaft on its Grant County properties. More than a year will be required to complete the new shaft, which will be known as the Princess.

Although the new shaft is for exploration purposes according to Leo H. Duriez, general superintendent, it is expected to reach zinc-lead ore bodies at depth.

Antimony Smelter Planned

In a recent announcement, the Bradley Mining Co. of San Francisco, revealed plans for the construction of an antimony smelter at Stibnite, Idaho, for the reduction of the antimony and gold concentrates produced from their Yellow Pine Mine. The Western-Knapp Engineering Co. of San Francisco will build the new smelter on which construction will start this summer. The schedule calls for the operation of smelter in the fall of 1949. The smelter will have sufficient capacity to treat antimony ores and concentrates from the surrounding region on a custom basis.

After calcining, the concentrates, along with oxides from the electric furnace, will be reduced to produce crude antimony bullion containing gold and silver. Two refining furnaces will remove the arsenic and iron content of the bullion and the refined antimony bullion containing the gold and silver will be transferred to two butane-fired converters to produce antimony oxide. The precious metals will remain in the converters as a rich residue for further refining. The antimony oxide will either be sold as such or reduced to antimony metal according to market demands.

Establishment of the new smelter, with its improved practice, will upgrade a large tonnage of otherwise non-commercial ore at the Yellow Pine Mine and should stimulate antimony mining in the Northwest.

Mining Company Formed

At Grand Junction, Colo., a group of mining and geological engineers have organized the Mineral Engineering Co. to give service to mining operations in that area. Officers of the new company are Blair Burwell, president; W. G. Haldane, secretary-treasurer; and R. G. Sullivan, vice-president and manager. Mr. Burwell was formerly the vice-president and general western manager of the U. S. Vanadium Corp. Mr. Haldane is past president of the Colorado School of Mines, and Mr. Sullivan is the former manager of the Boulder Tungsten Mills and a recognized authority on mine and tunnel construction.

USGS to Test Copper-Zinc Deposit

Two or three test holes will be drilled this month in a geological exploration of the Johnson Camp mining district, in northern Cochise County, Ariz. The work will be done by the U. S. Geological Survey, which has been mapping the geology of the area for the last three years. The purpose of the drilling is to check on some areas in which there is promise of copper-zinc ore deposits not yet discovered or well established. Johnson Camp is located southwest of Willcox and north of Dragoon, Ariz.

Northwest Gypsum Plant

With an estimated cost of $750,000, a new gypsum processing plant is expected to be in operation in Spokane, Wash., this summer, under auspices of the Columbia Gypsum Products, Inc., which has acquired property containing at least 40,000,000 tons of high-grade gypsum near Lake Windermere, B. C. T. H. Palmer, chief engineer and general manager, and J. S. Livingstone, company executive, state that open-pit mining of deposits began in May, at a rate of 700 tons daily. The raw gypsum will be shipped to Spokane for manufacture.

Galena Shaft Completed

The Federal Mining & Smelting Co., acting as agent for the AS&R and the Day Mines, Inc., has completed retimbering, enlarging, and sinking the Galena shaft in the silver belt just west of Wallace, Idaho, to a depth of 1000 ft. So far the work has proved to be in such difficult ground to hold that the company has found it necessary to change the shape of the shaft from a four-compartment in a straight line to a four-compartment square-shaped shaft. This will reduce the length of the wall plate and otherwise strengthen shaft timbering. The shaft is headed for the 3000, or sea-level depth, from which horizon the AS&R will further develop the Galena vein and Day Mines will crosscut south into the Fern property.

Cardiff and Rexall Mines Producing

Recent reports state that a newly-opened vein on the boundary line between the Rexall and Cardiff properties in the Alta Mining District, Utah, contains values estimated at $100 to $200 per ton. The face of ore showing is said to be more than 15 ft in width and 20 ft in height. The ore is being trammed to the south or Alta side of the property and shipped by truck down Little Cottonwood Canyon to a Salt Lake Valley smelter.

New Type Mill in Operation

Near Leadville, Colo., a milling venture which may be extremely important to smaller mining operations is now under way. A portable mill has been erected in cooperation with the American Cyanamid Co., agents for the patent owned by the American Lead, Zinc & Smelting Co. The heavy-media-type mill is designed to be transported on a truck without dismantling. Current tests are being made at the Garibaldi tunnel in California gulch.

International Mining Days Set

Annual celebration of International Mining Days and the regional meeting of the AIME in El Paso has been set for October 24, 25 and 26. Registration will take place the first day, with a cocktail party that evening in the Hotel Cortez. There will be a luncheon Monday, followed by a dinner dance at the El Paso Country Club. Tuesday will be featured by a Ranchero breakfast and an evening barbecue in Juarez, Mexico. The AIME will hold a banquet for its members on October 27 at the El Paso Country Club.

Phelps Dodge Promotions

Harrison M. Lavender, vice-president and general manager of Phelps Dodge Corp., has announced the following organizational changes at the corporation's Copper Queen and United Verde branches, all of which became effective May 15, 1948: J. B. Pullen, general superintendent of the United Verde branch, has been named manager of the Copper Queen branch and Douglas Reduction Works with headquarters at Bisbee; W. P. Crawford, assistant general superintendent of the Copper Queen branch, has assumed the position of general superintendent, Copper Queen branch; C. E. Mills, mine superintendent of the United Verde branch, was promoted to the position of general superintendent, United Verde branch, succeeding Pullen; W. W. Little, who has been assistant mine superintendent, succeeds Mills as mine superintendent, United Verde branch; M. G. Fowler, superintendent, Douglas Reduction Works, continues in his present capacity.

Unwatering Hercules Shaft

(*Continued from page* 40)

man could tell when the bailer hit the surface of the water through the "feel" of the impact and the slack of the cable. As soon as a sufficient weight of water entered the bailer, it would suddenly submerge, taking up the slack immediately. About ten seconds were required for the bailers to fill, and also about the same time to discharge them into the top pocket.

The principal delays in bailing were caused by:

(1) Lagging and timbers lodged crosswise in the shaft and tightly wedged in by the impact of the bailers themselves. The water was slightly acid and in 24 years' time had eaten away most of the nails and lag screws, etc. Much more difficulty was encountered in this respect than had been anticipated.

(2) Replacing guides, lagging, and ladders

(3) Minor but persistent mechanical and electrical difficulties during the first month's operation

(4) Changing shifts three times daily

(5) Holidays

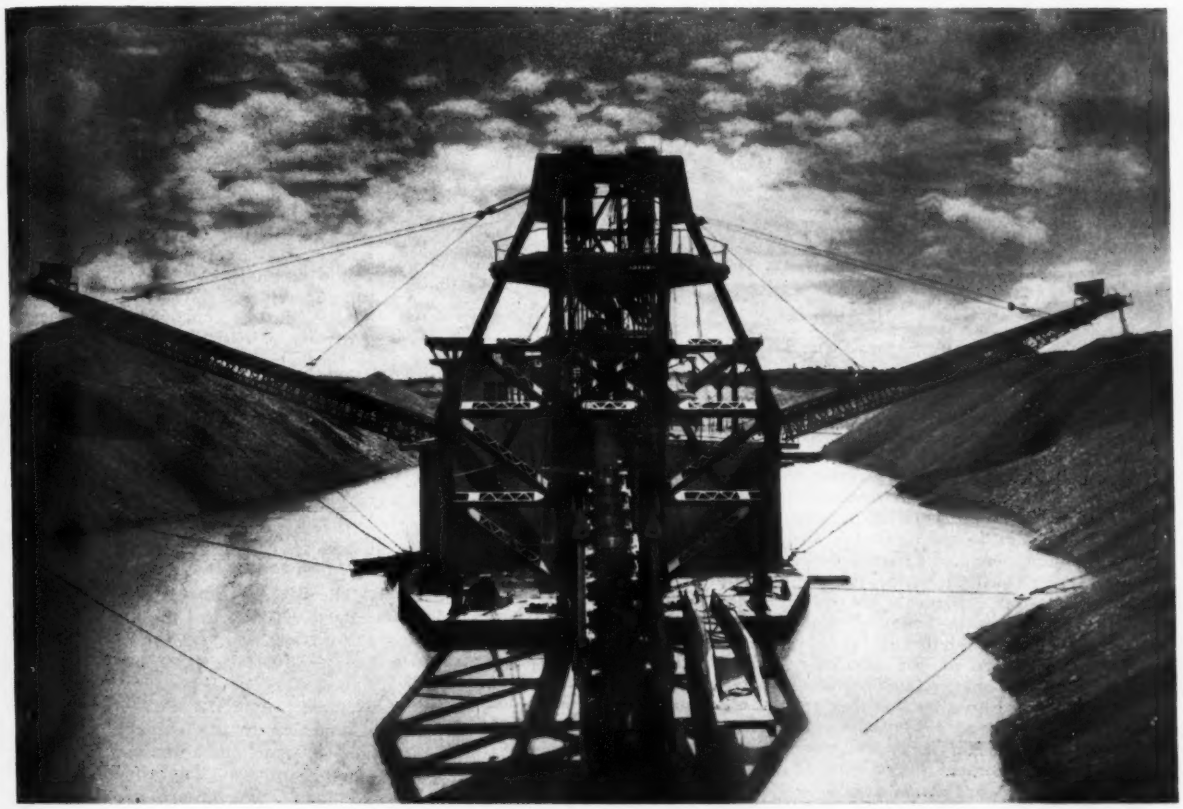
Bailing Saved Time

Now that the job is completed, it can be seen that the chief advantage of bailing over pumping lay in the fact that the water was removed by the hoisting method in much less time than suitable sinking pumps could have been ordered and delivered. It would have taken a 400 hp sinking pump, or preferably two 200 hp units to do the job. When the 1000 level was reached, only one of these would have been required as a station pump. Pumping may have saved a little labor as far as total costs were concerned. Owing to the fact that the hoist had not been used for more than a score of years, and that its duty in bailing was almost continuous, an oiler was employed on each shift in addition to the regular hoistman, to watch bearings, hydraulic pressures of the brake activating mechanism, cooling water, etc. This oiler would not have been required had the shaft been pumped out.

Rehabilitation of several of the lower levels is now under way preliminary to the exploration program originally planned. Six months or more may ensue before definite ideas are gained concerning its ultimate success. The workings are not in as bad condition as anticipated after being under water about 23 years. Principal caving has occurred on the sill floors of the old stopes. The shaft is only about 2½ in. out of alignment in the interval above the 400 station, where the old stopes, now well bulkheaded, cross it.

Levees Built by Gold Dredges–

IN CALIFORNIA



An 18 cu. ft. Yuba dredge equipped with double stacker to build levees at Hammonton, California, during gold dredging operations. This work was done in cooperation with U. S. Engineers in developing flood control channels on the Yuba River.

Every placer deposit presents peculiar conditions including the need sometimes, of constructing levees in cooperation with authorities charged with flood control or reclamation work. Several Yuba dredges in California have been used for gold mining in stream beds which have been improved during dredging operations.

The greater part of placer gold bearing ground is of little value for any use other than mining. Gravel bars, benches, and old river beds consist largely of ancient gravels laid down in the past. As dredging progresses these gravels can be stacked to form levees which soon are made solid by silt and sand inclusions. Thus many acres of farm and orchard lands adjacent to the rivers are protected from disastrous flooding.

Two California streams in particular, the Feather and Yuba, have been mined in part by dredges especially equipped or operated to build levees. The channels have been deepened and the course of the rivers controlled by rock-tailing levees built during dredging operations. The cities of Oroville and Marysville and the Gridley area in Butte County have benefited in recent years by stream control work accomplished in cooperation with state and federal authorities.

Whatever your problem, if it concerns placer dredging, Yuba from past experience can be of assistance. Deep ground, hard bedrock, river dredging, stream control and levee construction are only a few of the factors which have been successfully considered when designing Yuba dredges in the past. If you are interested ask for Yuba's free booklet about placer dredging.

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Greater Butte Project Launched with Start of Kelley Shaft

Collar of the Kelley shaft, which will be the main working entrance to the Greater Butte Project. From left to right the Anaconda Copper Mining Co. officials are: A. C. Bigley, general superintendent of mines; R. H. Glover, western general counsel; Andrew R. Sims, mine superintendent; R. H. Toole, foreman; H. J. Rahilly, manager of mines, and E. S. McGlone, vice president in charge of western operations. In the foreground are shaftmen William Peltomaa, left, and Rudolph Johnson.

WORK began on April 17 on the new concrete-lined shaft announced by Anaconda in their annual report. The shaft, a major part of the Greater Butte Project, has been named the Kelley in honor of Cornelius F. Kelley, chairman of the board of directors of the company, whose foresight, energy, and personal perseverance led to the undertaking.

It is being sunk at a spot centrally located on Butte Hill in ground free from major geological faults, and is far enough from ore zones not to be affected by mining operations. Ore hoisted through the Kelley will be in addition to that mined from present workings on the hill.

The shaft is expected to be sunk to a depth of 3400 ft from which workings will fan eastward. In connection with the project, experimental blocks have been caved in that area. In April, six feet of advance was made and the shaft collar was set. The shaft will be divided into three equal-sized compartments, 6½ ft square and a service compartment double that size. The over-all dimensions will be 38 by 9 ft, from rockwall to rockwall. The shaft will be lined with pre-cast, reinforced concrete slabs.

Two compartments will be for hoisting and will be equipped with 12-ton, bottom-dump skips of 250 cu ft capacity. The service compartment will be equipped with a cage capable of carrying 40 to 50 men or a full-sized mine locomotive on its deck. The other compartment will be for pipes.

A 3000-hp engine will power the skips and the present main engine of the Leonard mine, installed in 1943, will be moved to the Kelley and used to operate the cage. Also to be transferred from the Leonard will be its engine house and headframe, which was built entirely new and superimposed over the original Leonard headframe. The Leonard, at present the largest producer on the hill, will continue to operate with its original headframe and its present auxiliary engine.

Shaft bins of 2500 tons capacity are contemplated and a primary crushing plant consisting of two jaw crushers will be installed. A four foot wide belt will convey the ore 300 ft to 7500 ton capacity ore bins along the tracks of the Butte, Anaconda, and Pacific Railway, which will then carry the ore to the smelter at Anaconda, 35 miles away.

When completed, the Kelley will be the largest shaft in the Northwest and will compare favorably with any shaft in the United States in size. It has the added distinction of being the first shaft in the history of the Butte district to be located on a site selected by engineering methods.

The Greater Butte Project will cost $20,000,000 and will require five years to complete and bring to full capacity. It is expected to result in the production of 130,000,000 tons of ore yielding 20 lb of copper per ton, which will be in addition to the present output of copper, zinc, and manganese from existing mines. The timetable calls for 10,000 tons of ore per day after three years of preparatory work, with an eventual goal of 15,000 tons per day.

Inspiration Open Pit Now in Production

Inspiration Consolidated Copper Co., Inspiration, Ariz., started regular ore production from the open-pit section of its property on April 1.

Stripping and mining are handled by two electrically-operated shovels of 4 cu yd capacity, and one Diesel unit of 2½ cu yd capacity. The ore is hauled to the crushing plant, and waste to the dumps, in nine large haulage trucks of 22-ton capacity.

The ore is dumped directly from the trucks into the new coarse crushing plant, a 42-in. gyratory type crusher, and reduced to a maximum of 8 in. It is then conveyed to a new storage bin for delivery to the main coarse crushing plant. At that point, ore from the open pit joins that mined by underground methods and after further crushing is passed to the leaching plant for treatment. About 85 men, nearly all of whom were transferred from the underground crew and trained for the new type of work, are employed at the open pit.

Production of ore from this new development will not result in a greater daily output by Inspiration, but a portion of the mill requirements are to be mined by open-pit methods. The ore is expected to yield between 0.8 and 1.00 per cent copper, and to give the company a better balance of oxide and sulphide ores for leaching.

Arizona Tungsten Development

Ray E. Fernstrom of Tucson, Ariz., has acquired the famous Primos Chemical property, located approximately 6 miles northwest of Dragoon, in Cochise County, Ariz. He is rebuilding the Primos mill, developing an additional water supply, and expects to be producing a high-grade tungsten (hubnerite) concentrate soon. The operation is to be known as Fernstrom Mines.

Golden Cycle Plans Move

In order to avoid costly haulage of ore from the Cripple Creek district to the Golden Cycle mill at Colorado Springs, Colo., plans are being pushed for the construction of a reduction mill located in the Cripple Creek district.

Alfred Bebee, vice-president and general manager of the Golden Cycle Corp., pointed out that elimination of hauling the bulk ore 50 miles would result in more efficient and economic operation of the company.

Deep Mining at Cripple Creek

After a three-year shutdown during the war, the Cresson mine at Cripple Creek, Colo., reopened in April, 1946. A cave-in in the upper levels in July, 1946, was responsible for an additional three months' shutdown.

A drainage lateral from the Carlton tunnel approximately 3800 ft long is being driven from the bottom of the Portland No. 2 shaft to a point below the Cresson shaft to carry off water from the lower levels of the Cresson mine. At least six new levels will be driven in this area of the mine which will be water-free at the completion of the drainage lateral.

Rules and Regulations on Potash Lands Modified

On January 30, 1948, the Secretary of the Interior approved a modification of the potash rules and regulations eliminating the requirements that upon a year's notice a lessee of Federal potash lands might be required to sell as much as 10 per cent of his output to the Department of the Interior at a wholesale price to be determined by the Secretary.

The former rule was one of the industry's principal complaints against the regulations of the Interior Department as was brought out in the article on the development of the domestic industry by Horace M. Albright which appeared in the March issue of MINING CONGRESS JOURNAL. Curtailment of such regulations will enable the industry to make greater progress in the future and be of greater service to the country.

Idaho Mining Association Holds Annual Meeting

At a three-day intensive meeting at Sun Valley, Idaho, the Idaho Mining Association sponsored a series of outstanding technical papers. Dr. James Boyd, Director of the Bureau of Mines, heading the list of speakers, gave a thought-provoking address. R. E. Sorenson, chief geologist of the Hecla Mining Co., reported on the latest developments at the Silver Summit mine, which is said to be sufficiently extensive to add many years of life to the Coeur d'Alene district.

Edwin B. Douglas, manager of the Calera Mining Co. Blackbird Division spoke on the development of the vast cobalt deposit at the Blackbird mine near Forney, Idaho. Dr. Donald H. McLaughlin, president of the Homestake Mining Co., spoke on mineral policies. Dr. Carlton D. Hulin, of the department of geological science, University of California, spoke on Idaho minerals. Ira B. Joralamon, consulting geologist and engineer of San Francisco, discussed the question "Who Has the Gold?"

An additional number of eminent speakers delivered papers on specialized topics. Governor C. A. Robbins of Idaho gave the welcoming address at the convention opening.

Radio Talks Inform Public on Mining

A series of radio talks on mining covering activities in the Silver City area of southwest New Mexico are being given twice a week over Station KSIL, Silver City. Sponsor of this program is Chino Mines Division, Kennecott Copper Corp. Don Lusk, publisher-editor of the *New Mexico Miner & Prospector*, state-wide official magazine of the New Mexico Miners and Prospectors Association, is the commentator. The talks inform the public of the importance of the mining industry to the state's economy, and of the constant expansion of exploration and development of mineral resources.

Manufacturers Forum

Light at the Face

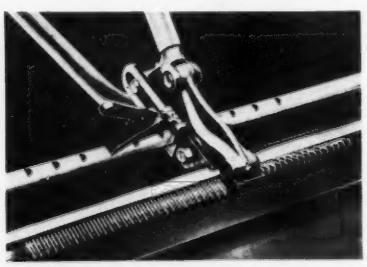
With the Ingersoll-Rand Airlite, a light-weight, air-powered generator, the light provided by two 75-watt bulbs is available as near as the closest air line. The convenient Airlite weighs 8¾ lb and when equipped with a 75-ft extension cord, should be a useful accessory in every mine. Air consumption at 90-lb pressure is 10 cfm, and output is 150 w at 115 v. The unit is 7¼ in. long and 5 in. wide. Further information on the AL-150 Airlite may be obtained from any Ingersoll-Rand office.

New Electric Blasting Cap

F. S. Elfred, Jr., general manager of the explosives division of Olin Industries, Inc., East Alton, Ill., recently announced a new waterproof and gasless, ventless delay electric blasting cap for rotation firing of successive shots. The new cap is made in 10 delays in one piece, single-diameter metal tubes. A gasless ignition mixture and delay train used in the new cap has permitted elimination of the vent formerly necessary to allow proper burning of the delay element.

National Mine Service Introduces Belt Fastener

In a recent announcement, Gordon MacVean, president of National Mine Service Co., Beckley, W. Va., announced that the company has been



appointed exclusive distributors for Hayden Belt Fastener Equipment. It is claimed that the Hayden system makes conveyor belt joints stronger than any other mechanical joint and as flexible as the belt itself in pulley travel as well as in loading stress. The report states that it is not necessary to remake both ends of a Hayden joint when extending or retracting a belt. The lengthening section of belt can be spliced into place using the existing imbedded Hayden hooks at either end of the belt insert. A portable fastening machine is used to make Hayden joints.

Utility Gasoline Engine

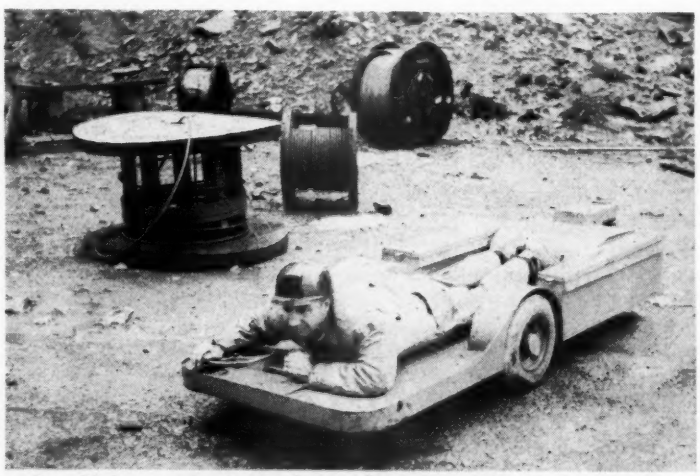
A series of single cylinder, air-cooled, gasoline engines with 4, 5, and 7 hp capacity are now available from the Gladden Products Corp., 635 W. Colorado Blvd., Glendale 4, Calif.

Personnel Vehicle for Low-Seam Coal Mines

Developed by J. H. Fletcher and Co., of Huntington, W. Va., a vehicle for low-seam operation may prove to be a most useful accessory in many mines. The 22-in. high, three-wheeled vehicle can accommodate one man, and with some squeezing, two. It can turn in a 9-ft entry on its 4 by 16 rubber tires as it moves forward or reverse at a single speed. The unit has a foot brake, and a chain drive for power and for steering. This useful vehicle can travel at the rate of three to four mph on the level and go as much as five miles distance on a single charge of its specially-shaped battery. It can navigate as much as a 30 deg grade. The unit weighs 700 lb stripped and 1200 lb complete with batteries.

The original unit is non-permissible but is now being designed for permissibility and will soon be under production by the Baker-Raulang Co. The cost of this useful piece of equipment will be close to the price of a Ford sedan.

This new innovation will have an application in speeding up the numerous trips that supervisory personnel must make in and around coal mines. In addition it will serve a useful purpose for emergency repairs where supplies and tools must be brought from the outside. It has been successfully tried at the Williams River Mine of the Gauley Mountain Coal Co. where it was found that the "Trike" could successfully navigate over-casts as well as affording a speedy and effortless means of covering the operating sections of the mine.



Sam Clark, general superintendent, Williams River Mine, Gauley Mountain Coal Co., demonstrates maneuverability of the "Trike."

Off-the-Road Diesel Trucks

For off-the-road hauling service, the Euclid Road Machinery Co. recently announced its Model LD Rear-Dump Euclid. A 275-hp Diesel engine provides power for hauling payloads of 60,000 lb over rough roads and steep grades. The top speed of the loaded unit is 20 mph.

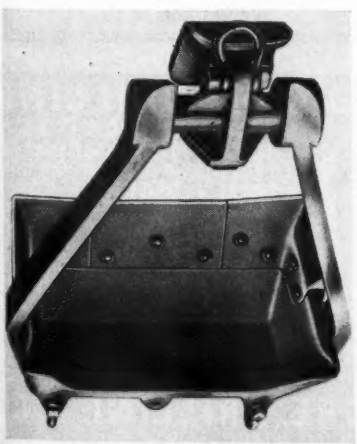
Slusher Sheave Block

Cate Equipment Co., Salt Lake City, is the distributor for a new-type, balanced slusher sheave block available in all sizes for underground and surface mining application. Roger V. Pierce, company sales manager, says, "its improved design includes many features demanded in a slusher and mining sheave block by experienced men in the field."

All-Welded Scraper

Alloy Steel and Metals Co., manufacturers of Pacific products, recently announced the addition of a 34 in. scraper to their line of all-welded scrapers. Similar to other scrapers in their Model A range, the new unit has manganese steel corner cutters and is reported to be balanced scientifically to assure a positive digging action on the in-haul and a full load regardless of the digging angle. Built-in runners of wear-resistant steel allow the scraper to ride over obstructions on the back haul. The addition of this new model provides a size and type of scraper for use with hoists ranging from 3 to 50 hp.

A Model HA 42 in. scraper will be manufactured to be dissembled for placement in working spaces too small for regular all-welded scrapers. This large bolted unit weighs 990 lb.



Improved Trolley Frog

Featuring a smooth connection between the wire and frog runner, the new trolley frog announced by the Ohio Brass Co., Mansfield, Ohio, is designed to provide a level path for the conductor to follow at all wire turnouts. By eliminating all abrupt bumping of the collector either entering or leaving the frog, one of the major sources of arcing may be eliminated. The new frog is said to permit faster haulage speed without reduction when passing through the frog.

Oscillating-Trough Conveyors

After a series of tests on actual installation, the Link-Belt Co. announces an oscillating-trough feeder-conveyor for handling materials in a horizontal path. It is available in standard trough widths of 12 to 48 in. and in single trough lengths of up to 100 ft. Two or more units may be arranged in series, one discharging into the other, and each equipped with an individual motor drive. The new conveyor is supported on a series of short arms and adjustable torsion bars. Copies of a 16-page book, No. 2244, is available from the company on request.

Light Weight Bore Hole and Mine Cable

According to a recent announcement, the U. S. Rubber Co. is ready to begin full scale production of aluminum bore hole and mine entrance cable providing savings in both cost and weight over equivalent copper cables. Successful tests have been made on both types of cable in several Alabama mines. No elaborate equipment is said to be required for lowering and supporting the aluminum bore hole cable because of its light weight. An acid and oil resistant neoprene rubber compound covers the cable. Both types of cable are made in various sizes ranging from 6 awg to 1,000,000 cm. Recently developed connectors and solders are reported to permit the splicing and connecting of aluminum conductors as efficiently as copper.

— *Announcements* —

Appointment of **John Walker** as manager of Off-Highway and Mining Truck Sales is announced by A. C. Fetzer, vice president of **Mack Trucks, Inc.** Mr. Walker, who has had wide experience in applying special engineering principles to unusual transportation problems, will make his headquarters in Mack's executive offices in New York's Empire State Building.

* * *

J. F. "Dutch" Hensgen of St. Louis has been appointed special mining representative for the midwestern division of **United States Rubber Co.** He will assist engineers in the selection of conveyor belting, wire and cable, and other rubber products used in the coal mines of Kentucky, Illinois, Indiana, West Virginia, Missouri, Arkansas, and other midwestern states.

* * *

H. M. Albers has been appointed assistant sales manager of the **Kensington Steel Co.**, Chicago.

* * *

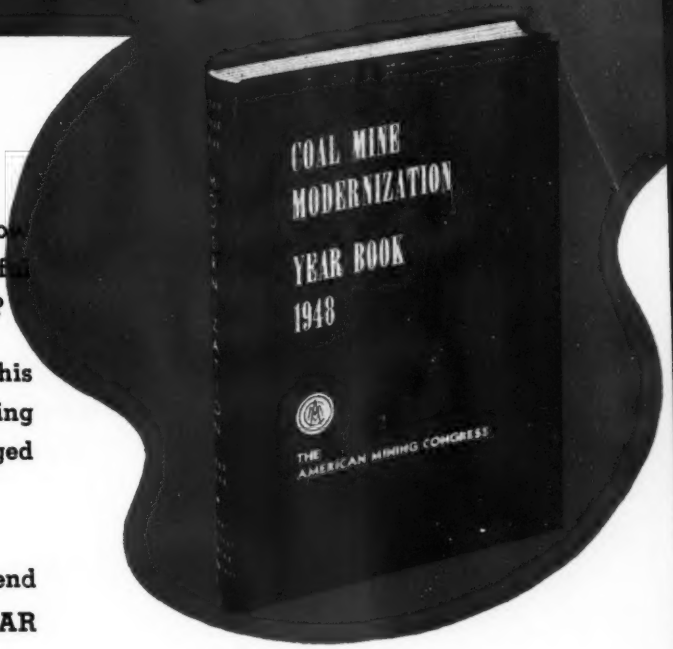
J. R. Hildinger has been appointed sales representative for the **Marion Power Shovel Co.** in a territory including western Ohio, a large part of the southern peninsula of Michigan, and the eastern half of Kentucky.

* * *

M. F. Bottomlee's appointment as sales and service engineer for the Rocky Mountain area for **Kennametal Inc.**, was recently announced. Mr. Bottomlee's territory ranges from North and South Dakota through the Rocky Mountain area down through the potash and metal mines of the Southwest.

— *Index To Advertisers* —

Ask yourself two questions



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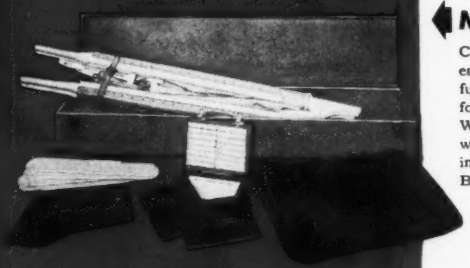
Completely equipped. Contains assortment of first aid materials and supplies suited to requirements of the mine hospital or dressing station. Contents conform to materials recommended by the United States Bureau of Mines for first aid treatment. Designed for wall mounting, or transportation when required. Bulletin FA-74.

M.S.A. *All-Weather* FIRST AID KITS

Sturdy steel cases are dustproof and moistureproof, with a replaceable rubber gasket sealing edges when closed. Contain complete assortments of unit-packaged first aid materials; each unit package contains one or more complete treatments, without waste. The unit packages fit like blocks in the cases. Bulletin FA-101.

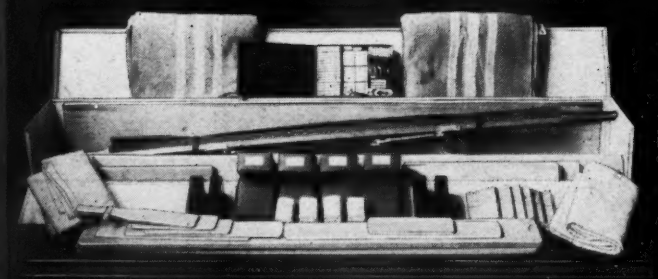


M.S.A. FOLDING STRETCHER OUTFIT

Complete emergency outfit in durable steel case—suitable for easy transportation underground. Folding stretcher opens to full-size army type. Included are a wool and a rubber blanket, four wood splints, two Heating Pads, and a 16-unit M.S.A. All-Weather First Aid Kit. Case is finished in red crackle enamel with white lettering. Dimensions are 56" x 12⅝" x 8". Carrying handles at ends and brackets for mounting are standard. Bulletin FA-77.

M.S.A. REDI-HEAT BLOCK

Safe emergency heat source for first aid applications—always ready for immediate use; produces top heat in 60 seconds—employs no liquids. Replaceable Redi-Heat charge is unaffected by heat, moisture, weather or temperature—has unlimited storage life. Wrapped in cloth, the M.S.A. Redi-Heat Block provides heat for approximately one hour per charge. Bulletin FA-92.



. . . and for FIRST AID TRAINING

THE M.S.A. CONTEST OUTFIT

Strong steel box contains complete list of materials recommended by U. S. Bureau of Mines for first aid practice and contest work. Specially designed to facilitate transportation, prevent loss of materials, and aids neatness and efficiency. The box is made of 24 gauge steel, finished in white, equipped with strong handles on each end. Write for details!

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